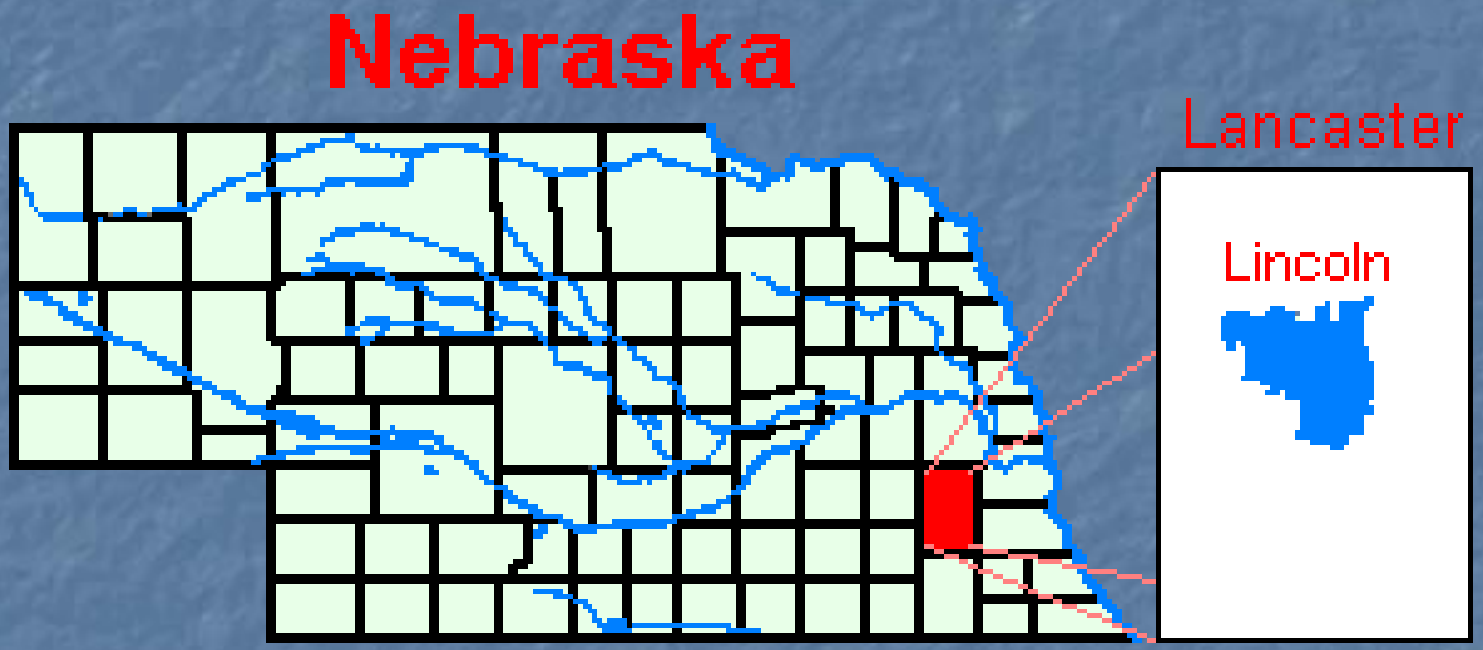
Veterinary Public Health Activities in Nebraska

Annette K. Bredthauer, DVM


Nebraska
Lancaster
Lincoln

Public Health Veterinarian

Position established December 2003

Responsibilities

- Rabies Control Coordinator
- Bio-terrorism, Agro-terrorism prevention
- Zoonotic disease surveillance

Public Health Veterinarian Responsibilities

- Responsible Antibiotic usage
- Liaison with Vets, government, universities and industry
- Medical Entomology
- West Nile Virus Surveillance

Zoonotic Disease

- Rabies
- Tularemia
- Q Fever
- Hantavirus
- Avian Influenza
- SARS
- Monkeypox
- Brucellosis
- Food-borne illness (animal origin)
- Parasites
  - Scabies
  - Headlice
- WNV

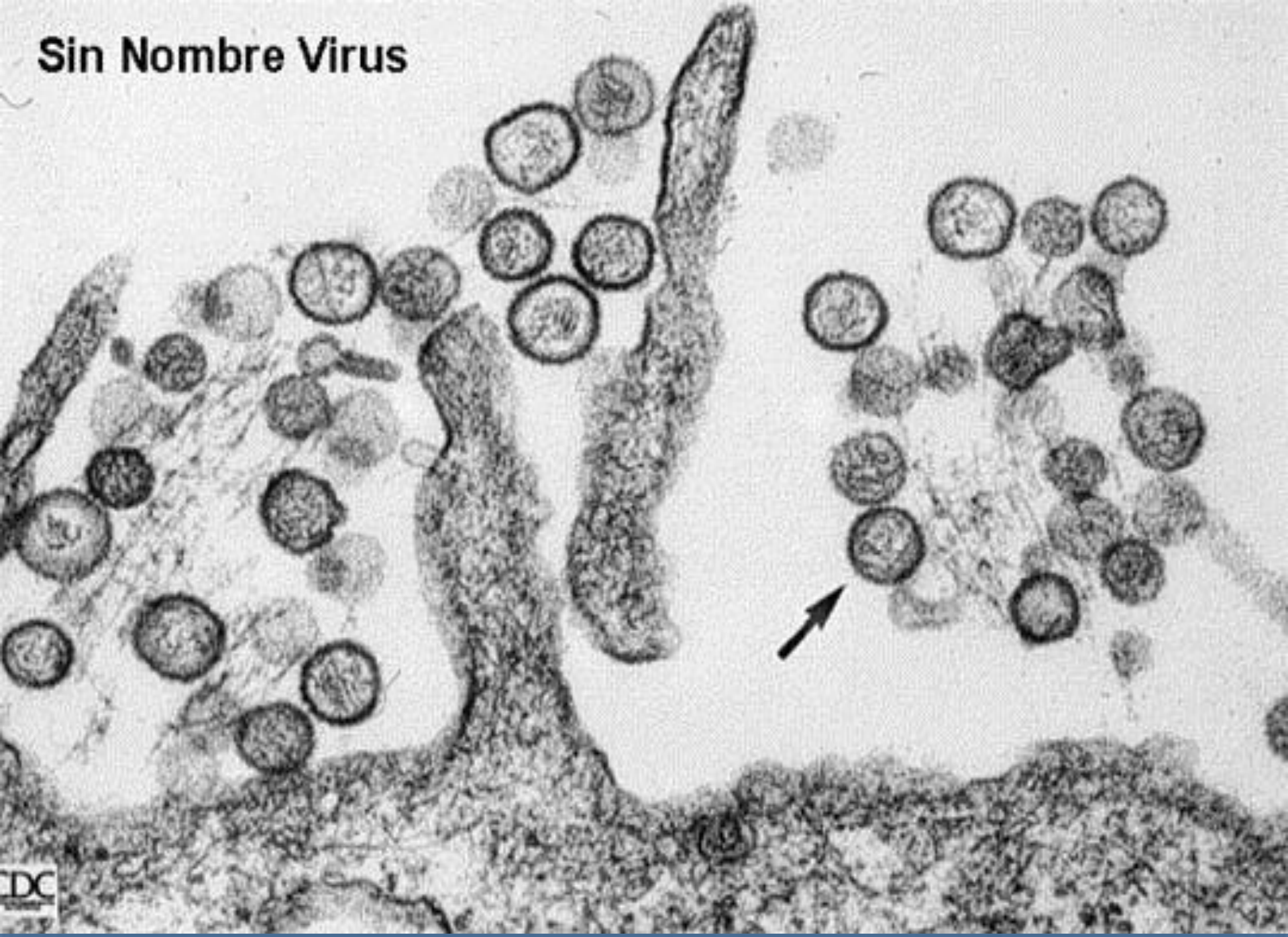
Zoonotic Diseases

- Psittacosis
- Salmonella
  - Food-borne infection- meat
  - Hamsters- Pet Shops
- LCM mice

Hantavirus Pulmonary Syndrome

Hantavirus Pulmonary Syndrome HPS

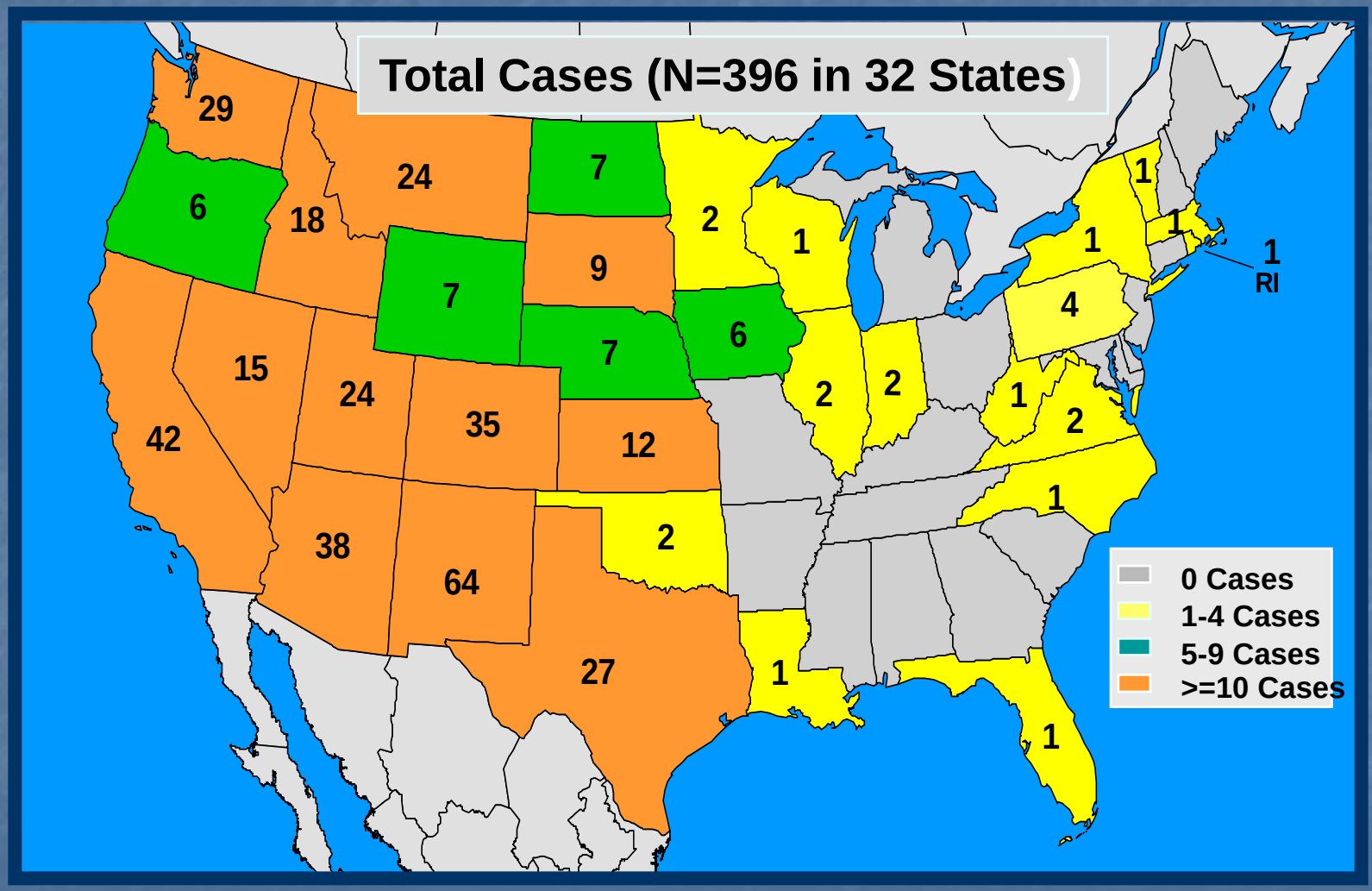
- Sin Nombre Virus
- Formerly Muerto Canyon Virus
- Bunyaviridae
  - RNA virus
  - Single strand, negative sense
  - Enveloped
  - Replicates in host cytoplasm


Sin Nombre Virus
CDC

Sin Nombre Virus

- Identified SW U.S. – 1993
- Endemic in rodents
- Primarily Peromyscus spp.
  - White footed mouse
  - Deer mouse
- Spread by rodent urine, feces, saliva
- Inhalation, rodent bites, wound contact

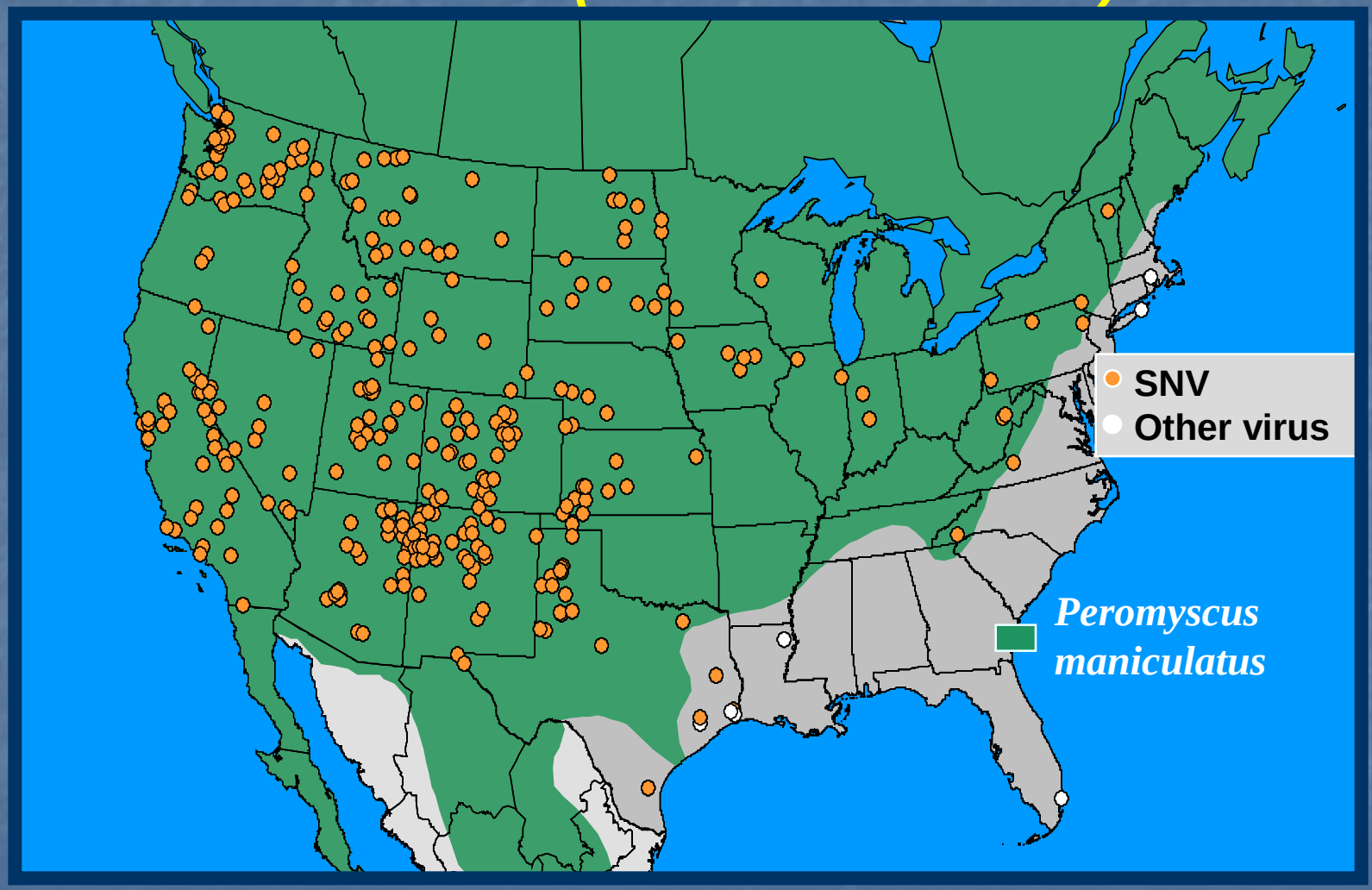
Hantavirus Pulmonary Syndrome Cases by State of Residence United States – July 6, 2005



Three cases were reported with unknown state of residence.

Distribution* of *Peromyscus maniculatus* and Location of HPS Cases as of July 6, 2005

Total Cases (N=396 in 30 States)



*Rodent distributions from: Burt WH, Grossenheider RP. A Field Guide to the Mammals. 3rd ed. New York, New York. Houghton Mifflin Company. 1980

Hantavirus Pulmonary Syndrome

- Exposure may occur 1-5 weeks before signs
- May not see rodents or rodent droppings

Hantavirus Pulmonary Syndrome

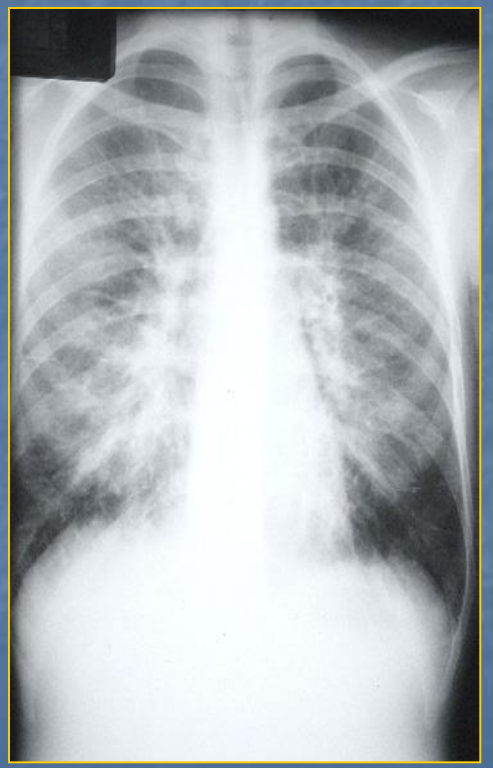
- Prodromal period: 3-5 days
- Fever
- Myalgia
- Chills
- Headache
- Dizziness

Hantavirus Pulmonary Syndrome

- Day 7
  - Cough
  - Nausea
  - Shortness of breath
  - Lung edema
  - High WBC, low platelets
  - Hospitalization within 24 hours
  - 50% Mortality rate

Hantavirus Pulmonary Syndrome
Radiographic Findings

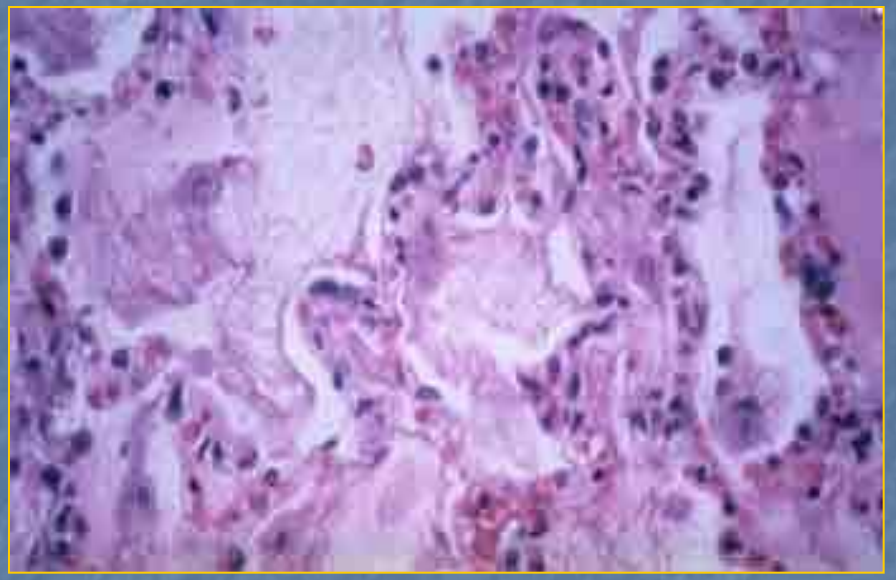
- **Bilateral interstitial infiltrates**
  - moderate to rapid progression
- **Bilateral alveolar infiltrates**
- **Pleural effusion**



Histopathology
Lung

Interstitial Pneumonitis

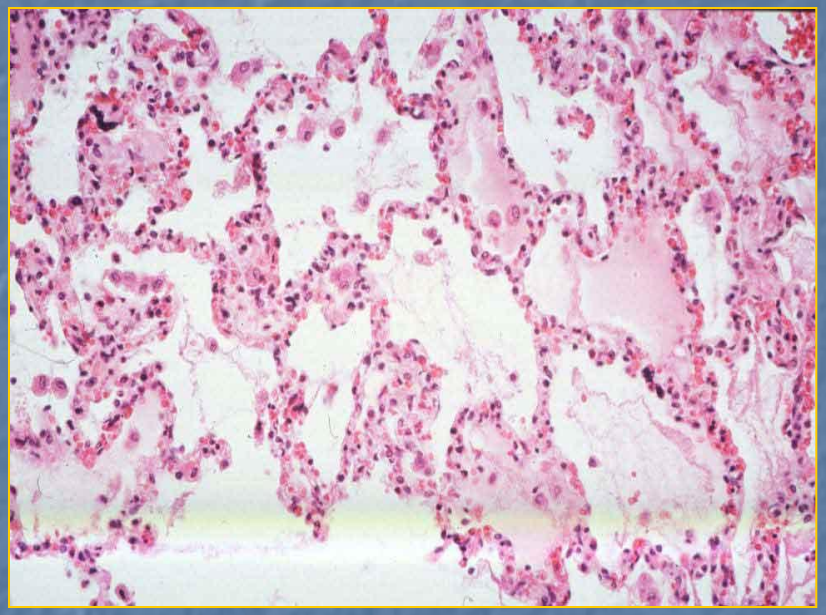
- Congestion
- Interstitial infiltrate of enlarged mononuclear cells (immunoblasts)
- Intra-alveolar and septal edema
- Focal hyaline membranes



Histopathology
Lung

Absence or minimal evidence of:

- Cellular debris
- Neutrophils
- Epithelial injury
- Viral inclusions
- Fungi or bacteria by specific stains



Histopathology
Other Organs

- *Enlarged mononuclear cells (immunoblasts)*
  - Lymph nodes (sinuses and paracortex)
  - Spleen (red pulp and periarteriolar sheaths)
  - Liver (triaditis)
  - Vessels (different organs)
- *Other changes (minor)*

Spleen

Hantavirus Case Definition

A febrile illness (i.e., temperature greater than 101.0 F {greater than 38.3 C}) characterized by bilateral diffuse interstitial edema that may radiographically resemble ARDS, with respiratory compromise requiring supplemental oxygen, developing within 72 hours of hospitalization, and occurring in a previously healthy person.

CDC

Hantavirus Case Definition #2

An unexplained respiratory illness resulting in death, with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable cause

CDC

Case Classification Confirmed

A clinically compatible case that is laboratory confirmed

Hantavirus Laboratory Criteria

1. Detection of hantavirus-specific immunoglobulin M or rising titers of hantavirus-specific immunoglobulin G

2. Detection of hantavirus-specific ribonucleic acid sequence by polymerase chain reaction in clinical specimens

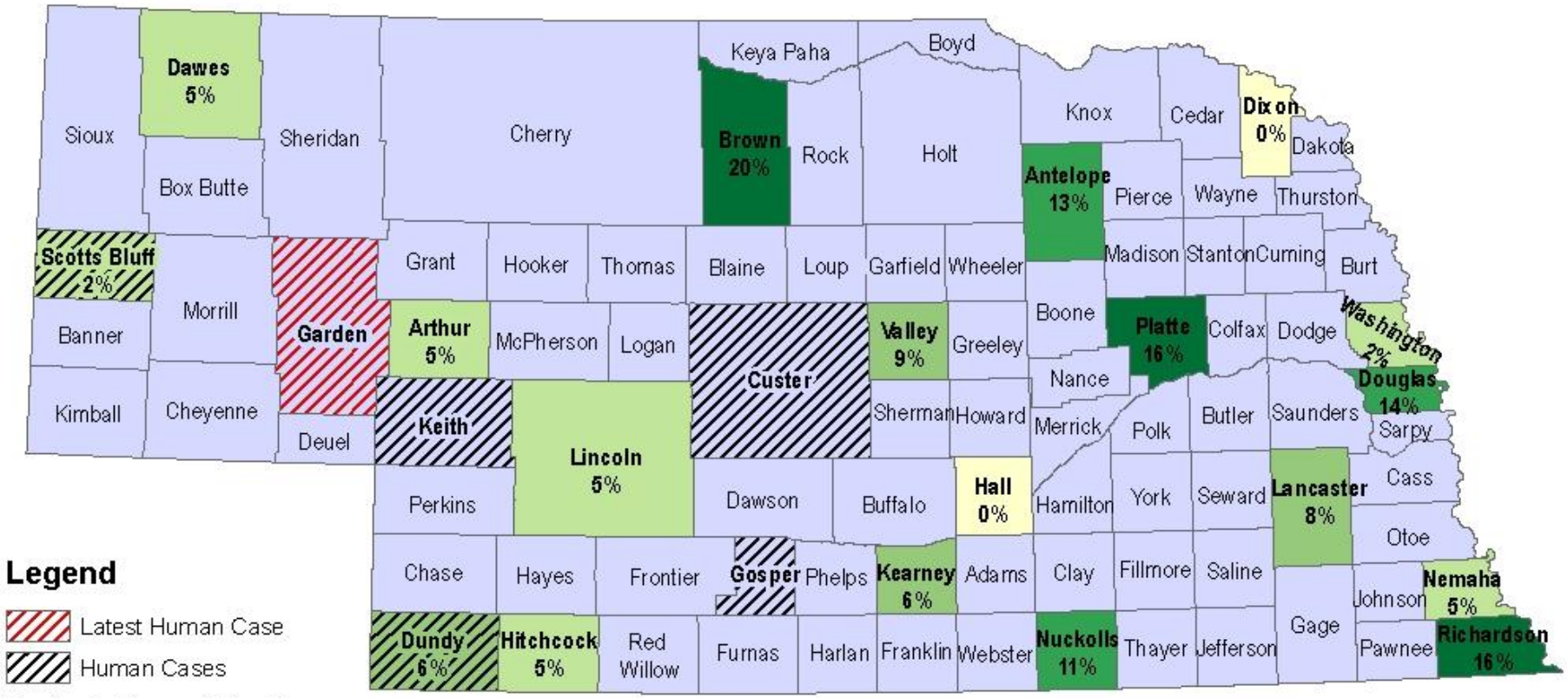
3. Detection of hantavirus antigen by immunohistochemistry

CDC

Nebraska Case Confirmed Hantavirus

Date	Age/Sex	Occupation	Exposure	Result
July 1998	40 M	Farmer	Grain bins	Lived
June 2002	30 M	Mechanic	Shop mice	Died
June 2002	41 M	Feedlot Manager	Hay	Lived
Oct. 2002	50 F	Office Mgr	Mice/farm	Lived
Nov. 2002	20 M	HVAC	Repairs	Died
June 2003	45 F	Baker	House repair	Lived
April 2005	52 M	Rancher	Hay	Died

Human HPS Cases 1998-2005



Legend

- Latest Human Case
- Human Cases

Rodents Percent Positive

- 0%
- 1 - 5%
- 6 - 10%
- 11 - 15%
- 16 - 20%

Source: Neb. Health & Human Services System

HPS Case #7

- White male 52 y.o. 68 in. 220 lb
- Garden County- Western Nebraska
- Rancher
- No drug, alcohol or tobacco issues
- History
  - Six week history of sinus congestion
  - Allergic rhinitis
  - 'Very strong, healthy, dynamic person'
  - Bag of gopher poison in back seat of pickup

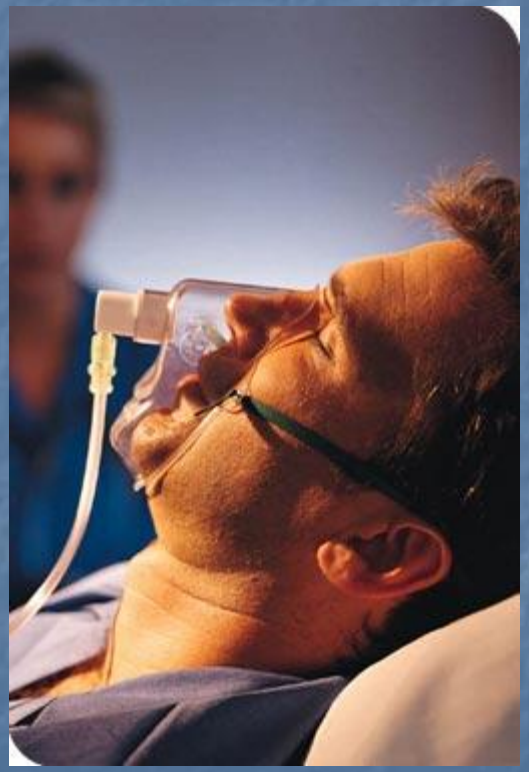
HPS Case #7

- 4-16-2005
  - Febrile 103° F, cough, weakness, described 'horrible myalgias'
  - Overnight hospitalization (Community hospital)
  - IV antibiotics, Levaquin Dx: bacterial pneumonia
  - Released to home
  - Fever continued, increasing respiratory distress

HPS Case #7

- 4-20-2005
- Community Hospital Emergency Room
- Tachypnea 150/min
- Hypoxic Oxygen saturation 70s
- Hypotensive

  systolic pressure 70-80 mm
- Radiographic Bilateral lung infiltrate
- WBC 47,000
- Platelets 27,000



Life Flight to University Hospital

- Temperature 96.6° F
- Pulse 123
- Resp. rate 30
- Blood pressure 70/30
- Sedated, intubated
- Positive pressure ventilation
- O_2 Saturation 72%
- Perihilar upper lung edema
- Friable tracheal mucosa with frothy secretions

Lab Results (4-21-2005)

	Patient	Reference
WBC cells/ul	70,000 Left shift	3,800-10,800
Hemoglobin g/dl	19	13.8-17.2
Hematocrit %	61.3	41-50
Platelets cells/ul	36,000	130,000-400,000
Calcium mg/dl	6.5	8.5-10.3

Sin Nombre Virus Serology

- IgG titer 1:100
- IgM titer 1:6400

IgM titer >=1:400 and IgG titer <=1:400

'Suggests acute infection depending on clinical history'

Optimally submit second sample for confirmation

HPS Case #7

- Patient deceased (4-21-05)
- Autopsy
  - HantaVirus Pulmonary Syndrome confirmed
  - Chronic Lymphocytic Leukemia
    - Undiagnosed
    - Possible contributing factor?

Public Health Response

- Determine patient risk factor(s)
- Search for other cases
  - Family members
  - Community
  - Epidemiologic patterns (BT)
- Educate the public
- Public Health Reports- NE, CDC

Public Education

- Rodents
  - Remove outdoor harborage
  - Seal houses against invasion
  - Remove food sources
  - Clean up rodent debris
    - Avoid aerosolization of urine/feces/saliva (wet down area)
    - Personal protection

Q Fever

The Organism

- *Coxiella burnetii*
  - Rickettsial agent
  - Obligate intracellular parasite
    - Lives in Acidic lysosomes
  - Stable and resistant in environment
  - Killed by pasteurization
  - Two antigenic phases
    - Phase 1: virulent, isolated from animals
    - Phase 2: less pathogenic

CDC Category ABC Agents

Category A

- Anthrax
- Botulism
- Tularemia

Category B

- Brucellosis
- Glanders
- Melioidosis
- Q Fever
- Viral encephalitis
- Toxins

Category C

- Nipah

Query Fever 1935

- Edward Derrick investigated cluster of acute febrile illness in Brisbane, Australian Abattoir workers
- Called it 'Malady Q'
- Initially thought to be virus
- Passed disease to Guinea Pigs with blood from affected humans

Montana 1935

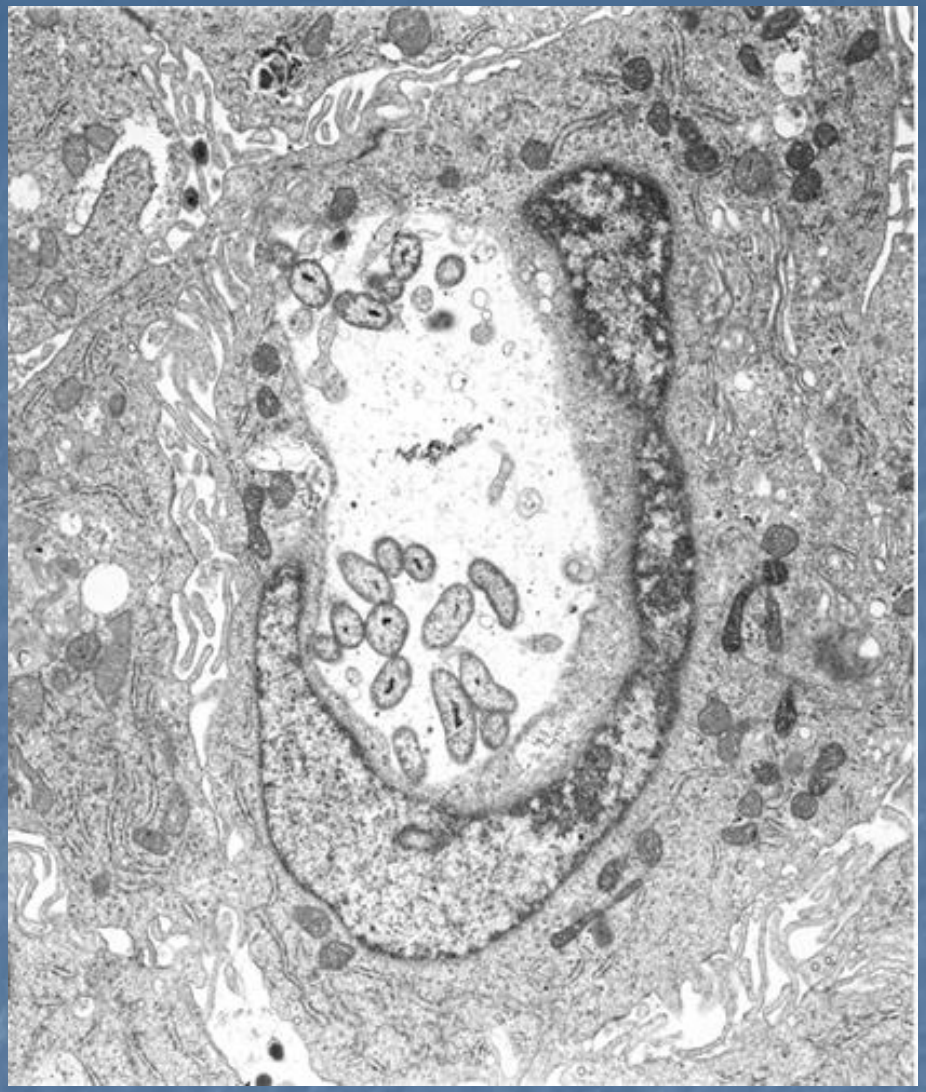
Gordon Davis studying RMSF

- Found ticks from Nine Mile Creek would spread disease to Guinea Pigs that was not RMSF
- 'Nine Mile Agent'
- Rickettsial organism found in ticks
- 1950 significance related to parturition
- Cox and Burnet worked to isolate and characterize organism

Environmental Persistence

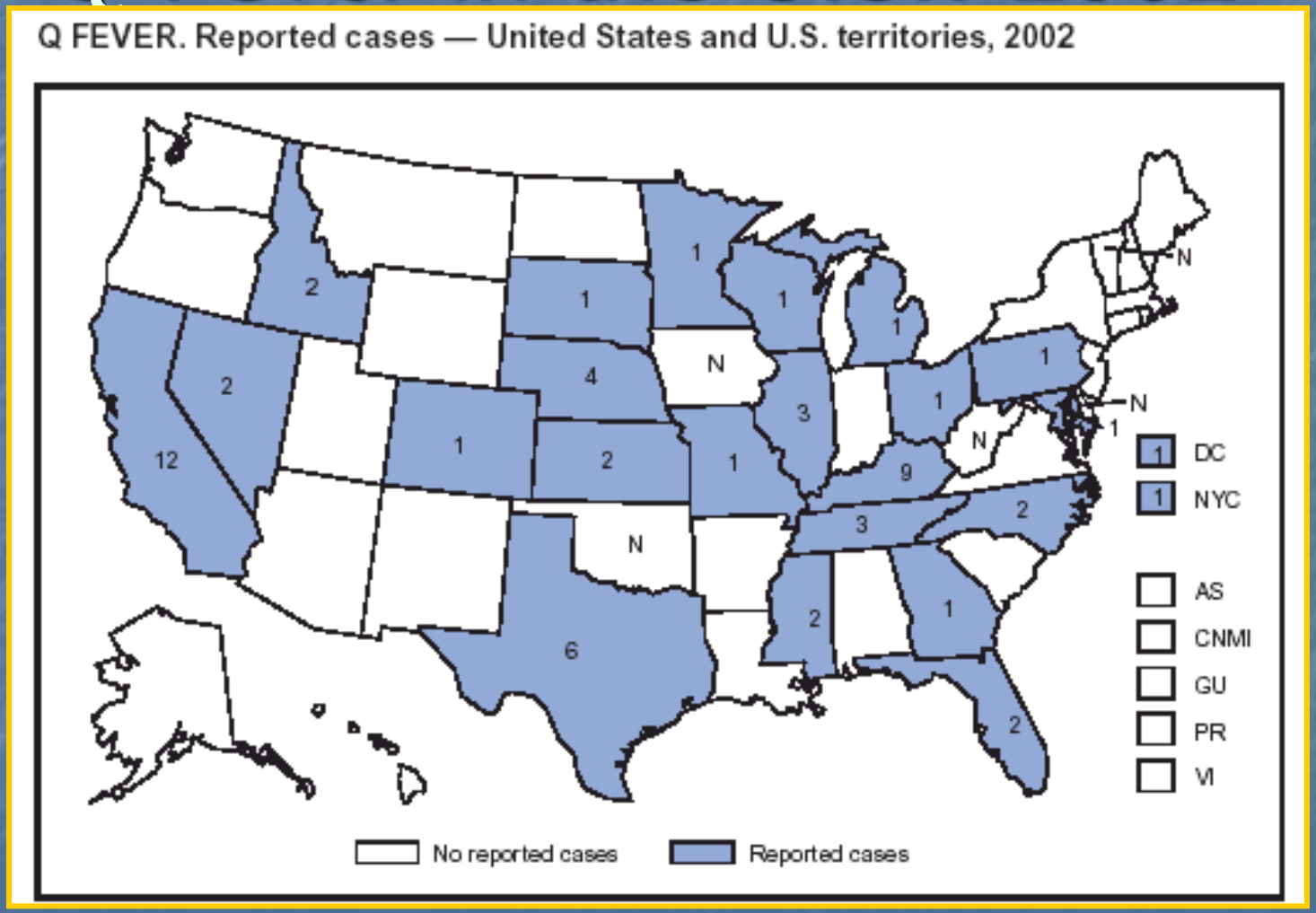
Shed in the environment in a small cell form that is very hardy ("spore-like")

- Resistant to pH changes, desiccation, UV light
- Resistant to some common disinfectants
- Remains viable in soil, dust for months to years
  - isolated from barns, soil – culture, PCR
- Raises questions regarding:
  - environmental contamination
  - appropriate cleaning/disinfection



Electron micrograph showing an infected monkey cell with one large vacuole harboring about 20 *Coxiella burnetii* bacteria. [Credit: R Heinzen, NIAID]

Q Fever in the U.S.: 2002



MMWR

Epidemiology

- Worldwide
  - Except New Zealand
- Reservoirs
  - Domestic animals
    - Sheep, cattle, goats
    - Dogs, cats
  - Birds
  - Reptiles
  - Wildlife

Epidemiology

- Occupational and environmental hazards
  - Farmers, producers
  - Veterinarians and technicians
  - Meat processors, Slaughterhouse
  - Laboratory workers

Transmission

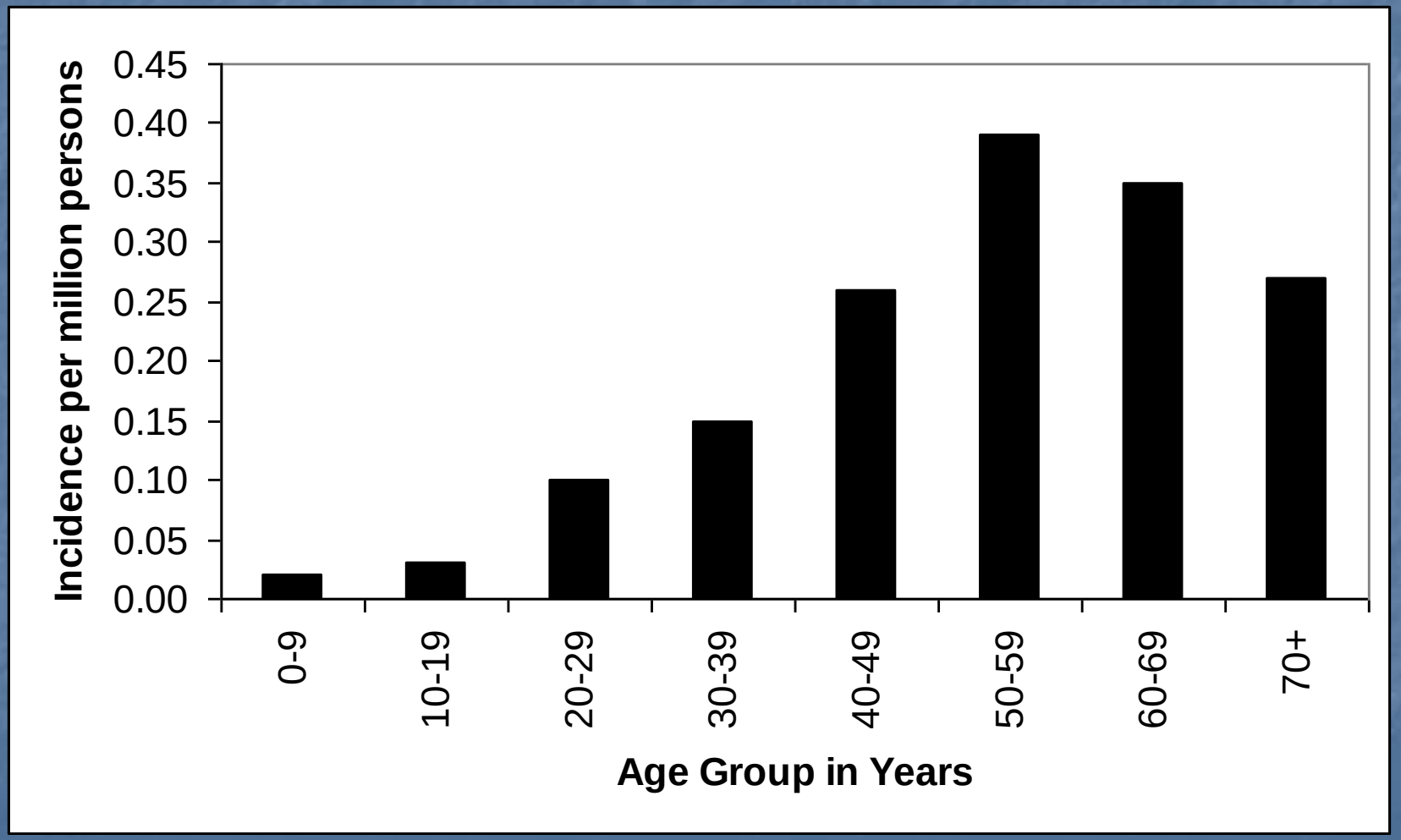
- Ruminants most common source of human infection
  - Cattle, sheep, goats
  - Parturient fluids
    10^9 bacteria per gram of placenta
- Domestic animals
  - Cats
- Wild animals (rodents)
- Birds (pigeons)
- Ticks
  - Importance debated

Transmission

- Wind-borne environmental spread
  - Can be spread several miles down-wind
- Contact with contaminated products
  - Straw
  - Fertilizer -- Manure
  - Farm equipment

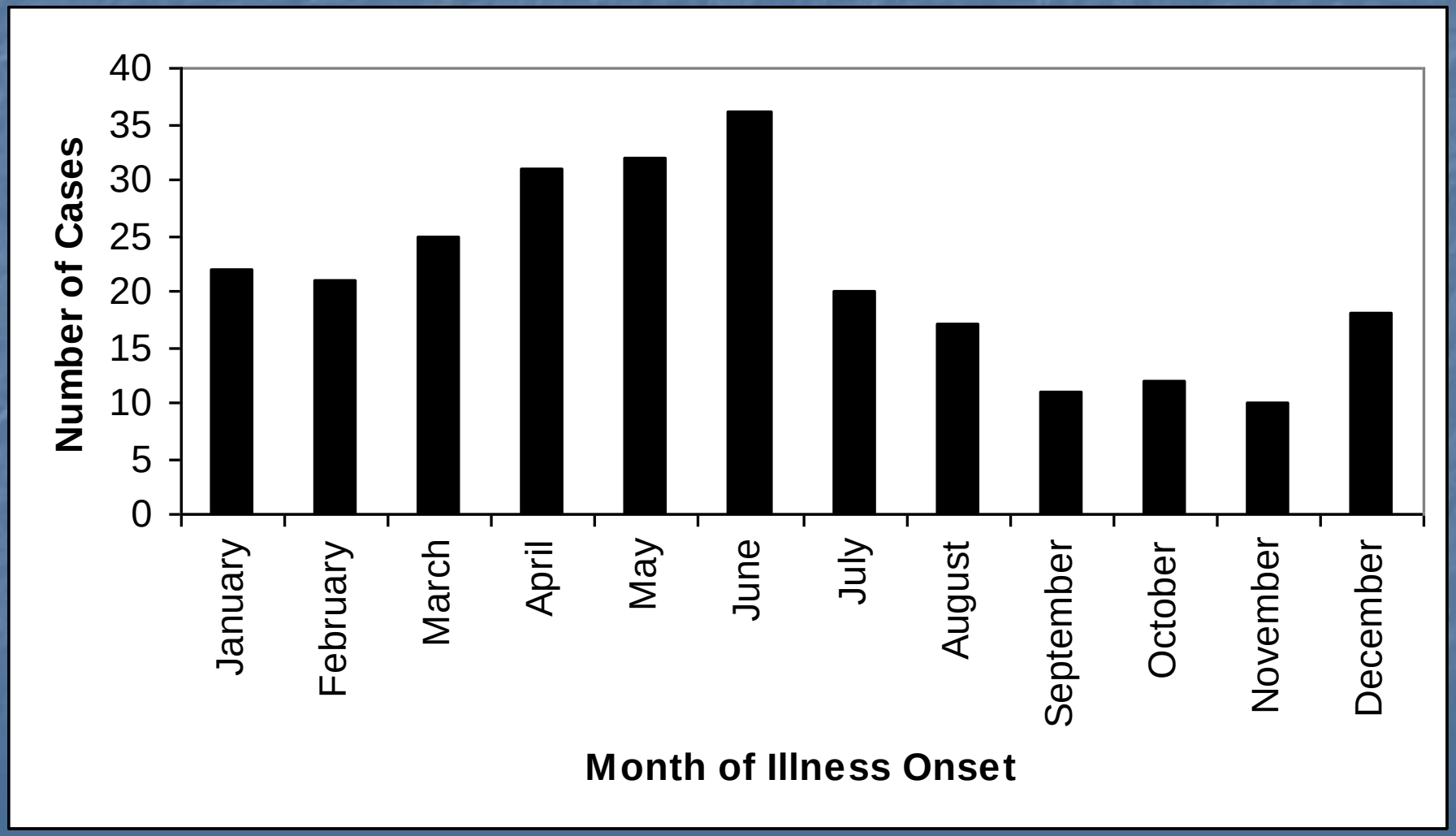
- Human-to-human rare (OB/GYN, sexual)

Age Distribution of Q fever Cases in the United States, NETSS 2000-2004



p< 0.0001

Month of Illness Onset, Q fever Cases in the United States, NETSS 2000-2004



Q fever Seroprevalence in the United States

Human Seroprevalence Studies :

- persons with livestock contact 7.8%
- general population 0.8%
- Risk Ratio 10.3 [95% CI 9.0-11.8])

• Ruminant Seroprevalence Studies:

- bovine bulk tank: 26.3%
- cattle: 3.4%
- sheep: 16.5%
- goats: 41.6%

• Vet school dairy herds, antibodies in milk

- 9/22 (38%) had titers ≥ 1:256

Current Surveillance for Q fever in the United States

- Q fever in animals is not reportable

- Human disease was made reportable in 1999
  - states report cases to CDC via NETSS
  - data available for 2000-2004

Animals and Q Fever

Animal Disease

- Sheep, cattle, goats
  - Usually asymptomatic
  - Reproductive failure
    - Abortions, stillbirths
    - Retained placenta
    - Infertility
    - Weak newborns
    - Low birth weights
    - Mastitis in dairy cattle
  - Carrier state

Animal Disease

- Other animal species
  - Dogs, cats, horses, pigs, camels, buffalo, pigeons, other fowl
  - Asymptomatic
  - Reproductive failure
- Laboratory Animals
  - Rats, rabbits, guinea pigs, hamsters
  - Varies from asymptomatic to fever, granulomas, or death

Morbidity and Mortality

- Prevalence unknown
  - Endemic areas
    - 18-55% of sheep with antibodies
    - 82% of dairy cattle
- Morbidity in sheep: 5-50%

Disease in Humans

Human Disease

- Incubation: 2-5 weeks
- One organism may cause disease
- Humans are dead-end hosts
- Disease
  - Asymptomatic (50%)
  - Acute <6 months
  - Chronic > 6 months

Acute Infection

- Flu-like, self limiting
- Atypical pneumonia (30-50%)
  - Non-productive cough, chest pain
  - Acute respiratory distress possible
- Hepatitis
- Skin rash (10%)
- Other signs (< 1%)
  - Myocarditis, pericarditis, meningoencephalitis
- Death: 1-2%

Chronic Disease

- 1-5% of those infected
  - Prior heart disease, pregnant women, immunocompromised
- Endocarditis
- Other
  - Osteomyelitis
  - Granulomatous hepatitis
  - Cirrhosis
- 50% relapse rate after antibiotic therapy

Risk to Pregnant Women

- Most cases asymptomatic
- Transplacental transmission
- Reported complications
  - In-utero death
  - Premature birth
  - Low birth weight
  - Placentitis
  - Thrombocytopenia

Prognosis

- Overall case-fatality rate <1 - 2.4%
- 50% cases self-limiting
- Only 2% develop severe disease
- Active chronic disease
  - Usually fatal if left untreated
  - Fatality for endocarditis: 35-55%
  - 50-60% need valve replacement

Case Definition

Clinical Description

An acute febrile rickettsial disease; onset may be sudden with:

- chills
- retrobulbar headache
- weakness
- malaise
- severe sweats

May see interstitial pneumonitis on x-ray

CDC

Confirmed Case

A clinically compatible case *and*

- Fourfold or greater change in antibody titer to *C. burnetti* antigen by IF, microagglutination, CF, or ELISA *or*
- Identification of *C.burnetti* by immunostains or electron microscopy *or*
- Isolation of *C.burnetti* from blood

CDC

Case Classifications

- "Probable" classification not used
- "Possible" only used until confirmation is obtained; no possible case classifications are retained

Diagnosis

Serology (rise in titer)

- IFA, CF, ELISA, microagglutination

- DNA detection methods
  - PCR
- Isolation of organism
  - Risk to laboratory personnel
  - Rarely done

Treatment

- Treatment
  - Doxycycline
  - Chronic disease – long course
    - 2-3 years of medication
- Immunity
  - Long lasting (possibly lifelong)

Case Background

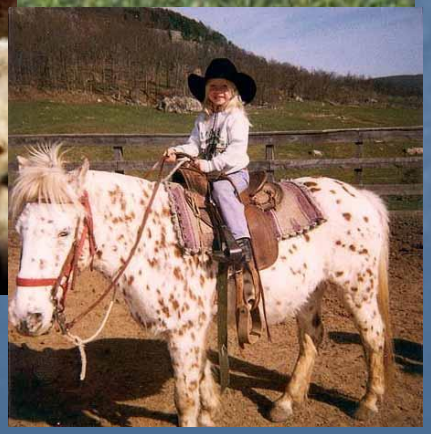
- 3/25/2005

  Information phone call from UNL Veterinary Diagnostic Lab to HHSS
  - Goat sera #1: + > 1:20 for *C.burnetii*
  - Goat sera #2: - @1:10
  - Placenta: + PCR
  - Owner complaint: goat abortions, weak kids
  - *Public Health risk?*

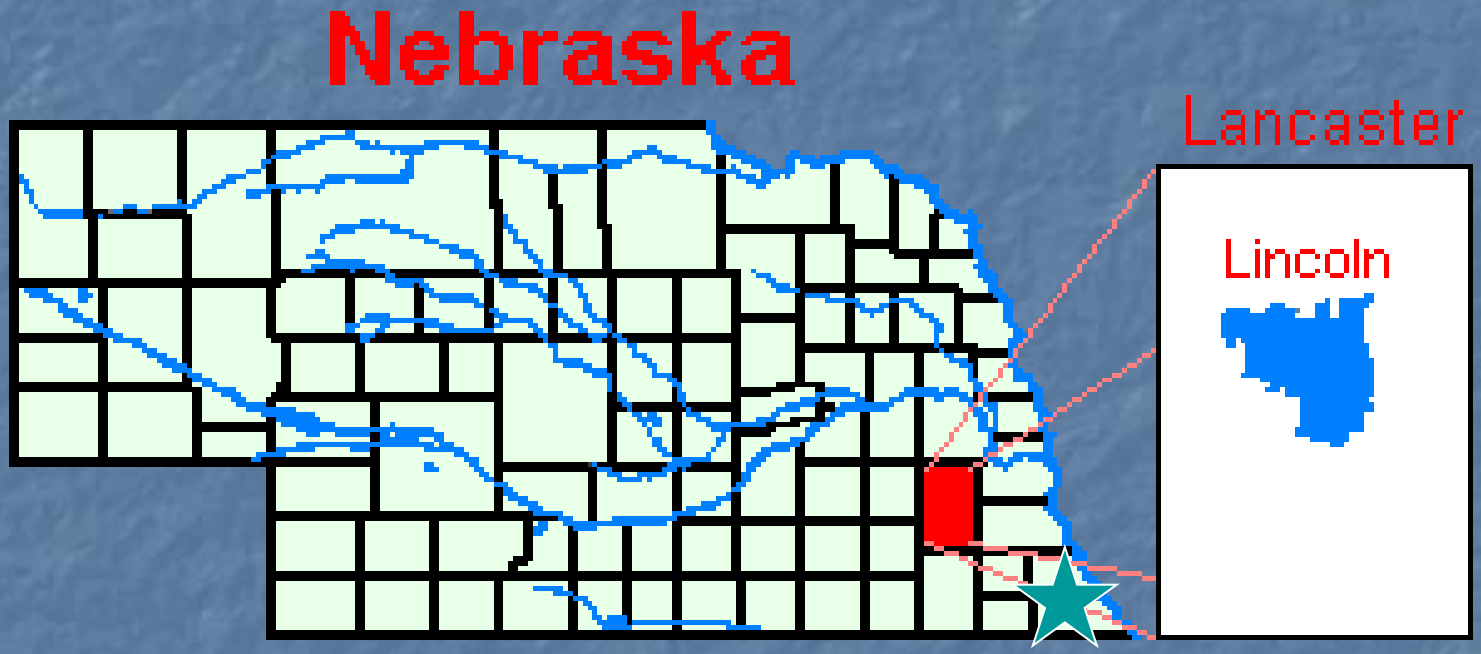
"…..This is the worst luck we ever had kidding out these goats. And if that wasn't bad enough, my wife and I have both had the 'flu' that just hangs on and on …"

Case #1

- Male Farmer age 36
- Excellent health
- Southeast Nebraska
- Livestock on farm
  - 100 + Boer Goats
  - Cattle
  - Riding horses



Cases #1, #2



Case #1

- Onset 2/18/2005
  - Fever 103.7 ^{o}F
  - Myalgia
  - Malaise
  - Anorexia– weight loss
  - Chills
  - Sweating
  - Weakness
  - Cough

Case #1

- Did not complain of:
  - Retrobulbar pain
  - Headache
- Unusual Activity?
  - Assisted parturient goats
    - Cleaned up after parturition, abortions

Case #1 History

- 100 + Boer Goat reproducing females
  - Purchased 10 additions in early Fall from Sale barn
  - 50 does kidded in December normally
  - 50 does kidding in January/February
    - 22 does affected
      - Pre-mature births
      - Weak kids- died without 'intensive care'
      - Retained placentas

Case #2

- Woman age 36 yr
- Elementary School Secretary
- Spouse of Case #1
- Worked with Goat does/neonates
- Excellent health

Case #2

Onset 02-05-2005

- Fever 100.1°F
- Myalgia
- Retrobulbar pain
- Malaise
- Headache
- Anorexia
- Chills
- Sweating
- Weakness
- Cough

Missed 4 days of work

Case #2

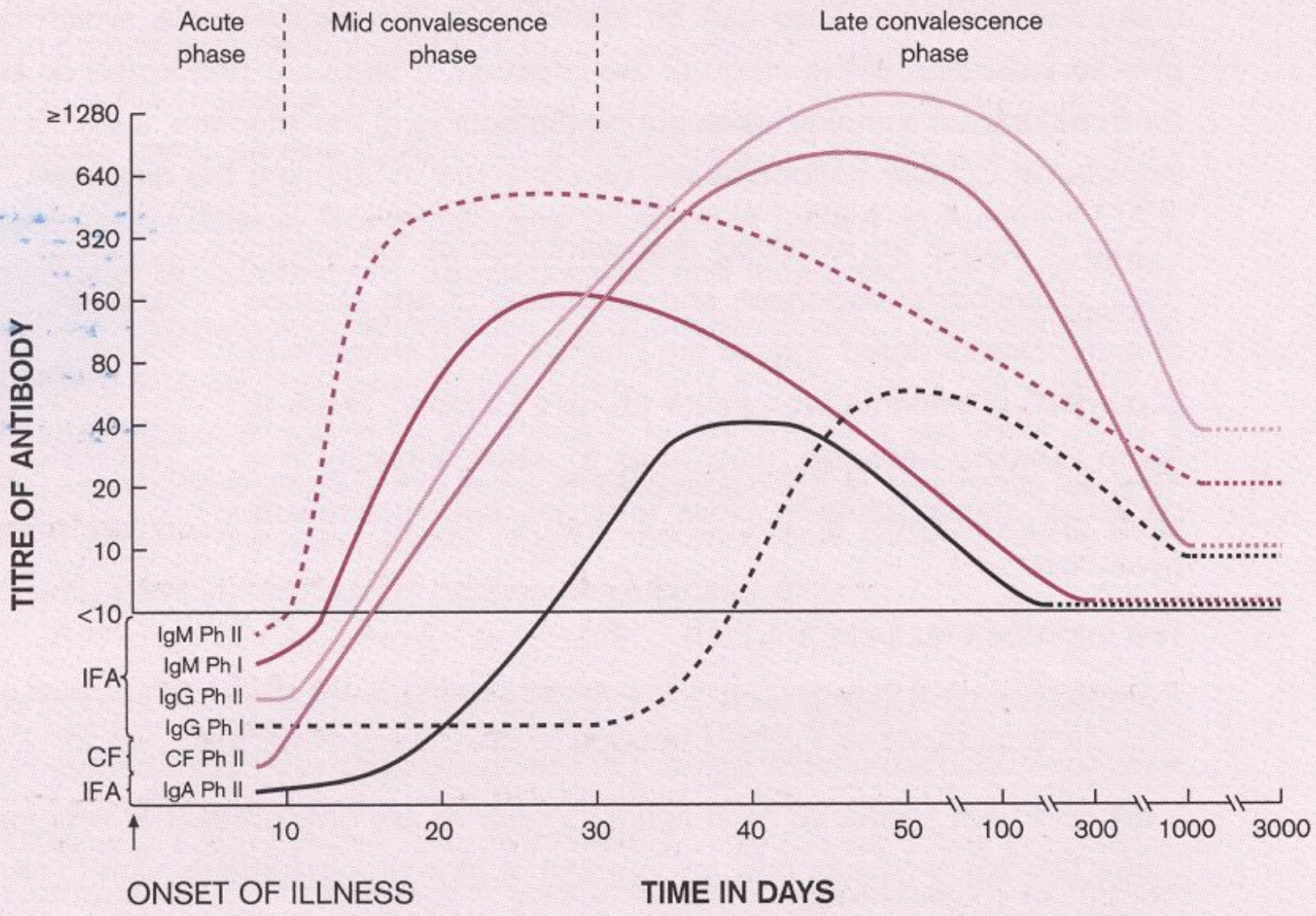
- Reported that she 'pulled many kids'
- Nursed pre-mature neonates
- Course of disease 5 weeks
  - Examined by 3 physicians
  - Q Fever not considered
- Doxycycline therapy based on positive goat placenta PCR

Serology Results

	I- IgG 3/9/05	II-IgG 3/9/05	I-IgG 5/1/05	II-IgG 5/1/05
Case #1 Male	<32	128	<32	256
Case #2 Female	128	2048	512	512
Son Age 15	No samples	No samples	4096	1024

Titers > or = 128 suggest exposure to or infection with *C.burnetti*

Figure 4. Idealised representation of antibody responses to *C burnetii* Phase I and II antigens during acute Q fever - as measured by immunofluorescence (IF) and by complement fixation (CFT) (modified from reference 28).



Q fever and Bioterrorism

- Category B bioterrorism agent
  - high morbidity
  - inhalation route of transmission
  - extreme persistence in environment
- Previous development as an agent of bio-warfare
- Accessible – obtain from environment

Why is Surveillance so difficult?

- Nonspecific clinical signs
  -resembles a variety of other common illnesses
  - self-limiting in most cases
  - poor physician recognition

- Requires laboratory confirmation for reporting
  - Serology requires paired serum specimens
    - early specimens frequently negative
    - patients rarely return to provide convalescent samples
  - Physicians must request appropriate tests

Prevention and Control

- Pasteurization of milk from cows, sheep, goats

Eradication not practical

- Too many reservoirs
- Constant exposure
- Stability of agent in environment

Prevention and Control

- Education
  - Sources of infection
- Good husbandry
  - Disposal of birth products (incinerate)
    - Lamb indoors in separate facilities
  - Disinfection
    - 0.05% chlorine
    - 1:100 Lysol
- Isolate new animals

Public Health Response

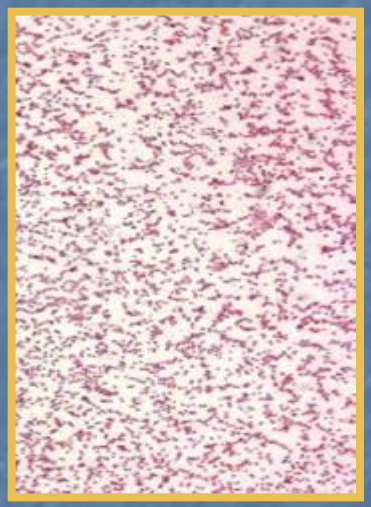
- Determine patient risk factor(s)
- Search for other cases
  - Family members
  - Community
  - Epidemiologic patterns (BT)
- Educate the public
- Public Health Reports
  - Reportable Disease

Tularemia

Rabbit Fever, Deer Fly Fever

The Organism

- *Francisella tularensis*
  - Gram negative
  - Intracellular pathogen
    - Macrophages
  - Survival-persistence
    - 3-4 months in mud, water dead animals
    - >3 years in frozen meat
  - Easily killed by disinfectants
  - Inactivated by heat



Francisella tularensis

CDC Category ABC Agents

Category A

- Anthrax
- Botulism
- Tularemia

Category B

- Brucellosis
- Glanders
- Melioidosis
- Q Fever
- Viral encephalitis
- Toxins

Category C

- Nipah

Subspecies

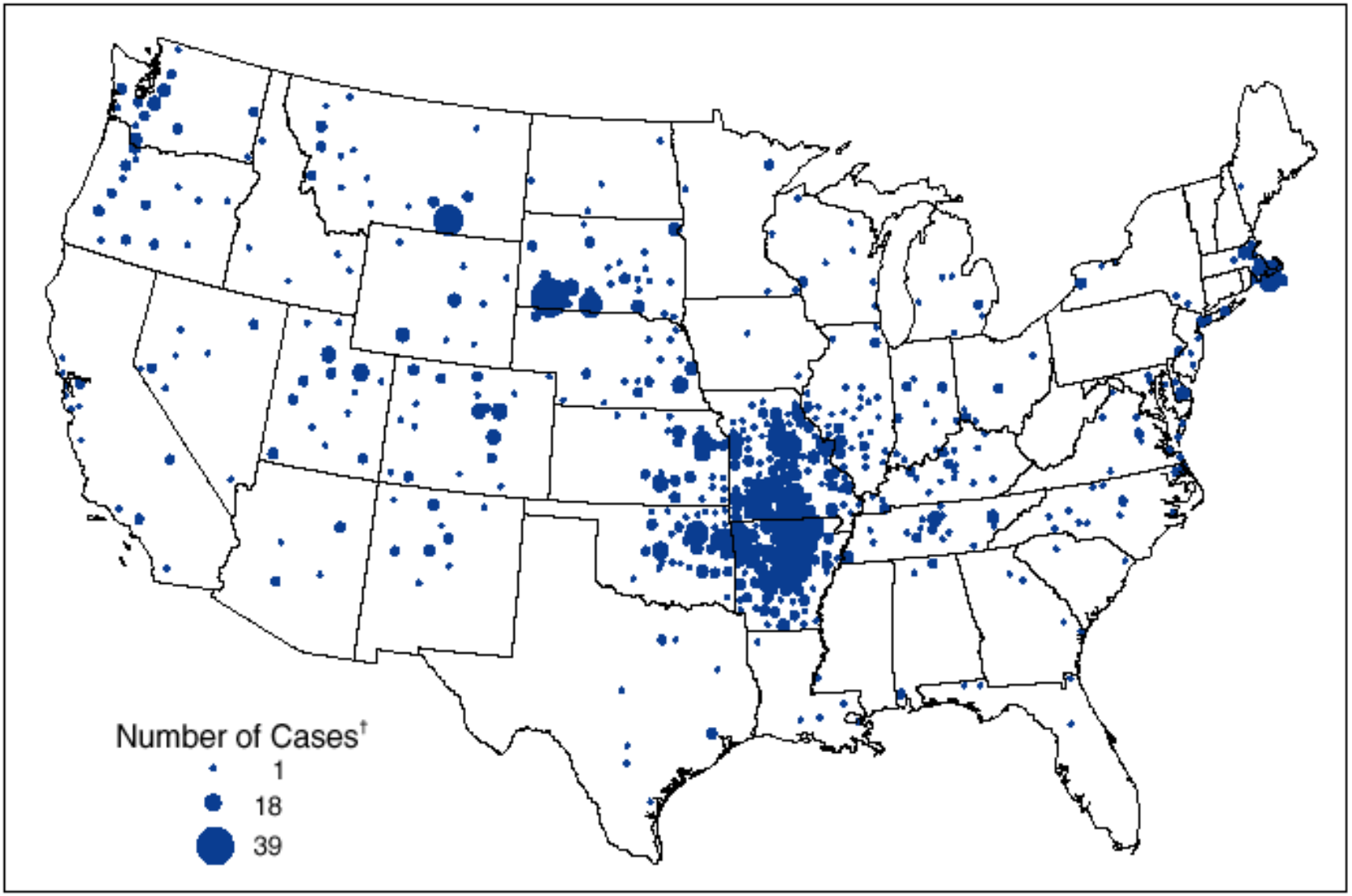
- *F. tularensis* biovar tularensis (Type A)
  - More virulent
  - Found in North America
  - Reservoirs
    - Rabbits and hares
    - Ground squirrels
    - Ticks

- *F. tularensis* biovar palaearctica (Type B)
  - Less virulent
  - Found in Eurasia and North America
  - Reservoir
    - Muskrats, water rats
    - Voles, mice, rats
    - Other rodents

Epidemiology

- Northern hemisphere only
  - North America, Europe, Russia, China, Japan, Mexico

FIGURE 2. Reported cases* of tularemia — United States, 1990–2000



Transmission

- Reservoirs
  - Many mammals, ticks, and some birds
    - Rabbits, hares, beavers, muskrats,
    - domestic animals, hard ticks
  - Ticks and rabbits most important
  - Rodent-mosquito cycle in Russia, Sweden
- Infectious dose
  - Small for inoculation or inhalation (10-50)
  - Large for oral (10^8)

Transmission

- Vector-borne
  - Ticks
    - Transovarial transmission
    - 14 species
      - *Dermacentor andersonii*
      - *Dermacentor variabilis*
      - *Amblyomma americanum*
  - Mosquitoes, flies (Sweden)
    - Less frequently
      - *Chrysops discalis* (Deer fly)

Transmission

- Direct
  - Contact with tissues of rabbits or other infected mammals
    - Skinning, necropsy
    - Handling contaminated skins, paws
- Ingestion
  - Undercooked meat
  - Contaminated water
    - Waterborne outbreaks

Transmission

- Aerosol
  - Contaminated dust
  - from hay, grain or soil
  - Laboratory testing procedures
- Bites or scratches (rare)
- Not person-to-person

Human Disease

- Incubation
  - 3-15 days
  - Varies with virulence of strain and dose
- Initially all forms start with
  - Sudden fever
  - Chills
  - Headache
  - Myalgia
- 6 clinical syndromes
  - Ulceroglandular
  - Glandular
  - Oculoglandular
  - Oropharyngeal
  - Typhoidal
  - Pulmonary

Human Disease

- Ulceroglandular
  - Most common
  - Ulcer and regional lymphadenopathy
    - Ulcer 1 week-months
- Glandular
  - Regional lymphadenopathy, no ulcer
  - Second most common
- 75-85% of all cases

Human Disease

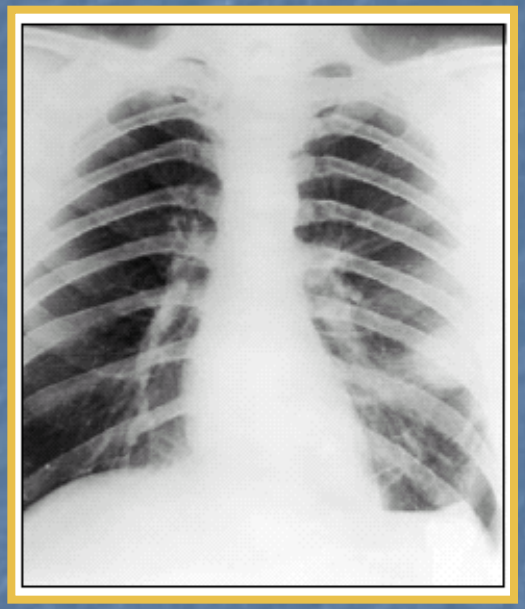
- Oculoglandular
  - Conjunctiva infected
    - By contaminated fingers
    - Contaminated material splashed into eye
  - Conjunctivitis
  - Regional lymphadenopathy
  - Severe form
    - Ulceration of conjunctiva
    - Ocular discharge

Human Disease

- Oropharyngeal
  - Ingestion
    - Hand-to-mouth
    - Consumption of undercooked meat or water
  - Pharyngitis, diarrhea, abdominal pain, vomiting, GI bleeding, nausea
  - Pseudomembrane may develop over tonsils

Human Disease

- Typhoidal
  - Acute
  - Septicemia
    - Without lymphadenopathy or ulcer
- Pulmonary
  - Inhalation of aerosol
  - Spread through bloodstream
  - Complications from other forms
- Case-fatality (untreated): 30-60%

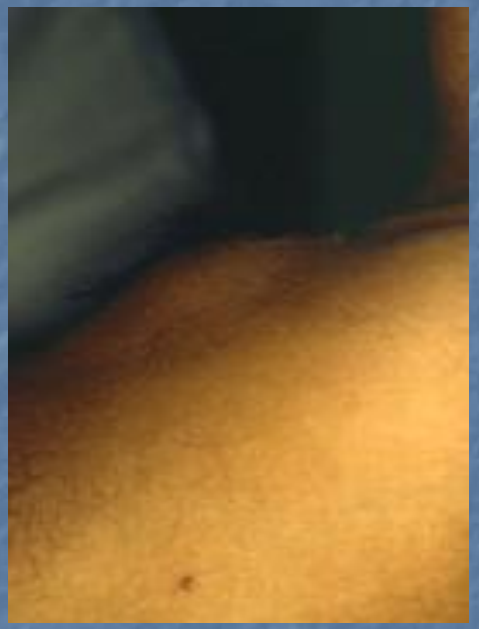


Tularemia

Tularemia

Eschar from rabbit bite

‘Heaped up” ulcer



Axillary bubo

Clinical Description

An illness characterized by several distinct forms, including the following:

- *Ulceroglandular (cutaneous ulcer with regional lymphadenopathy)*
- *Glandular (regional lymphadenopathy with no ulcer)*
- *Oculoglandular (conjunctivitis with preauricular lymphadenopathy)*
- *Oropharyngeal (stomatitis or pharyngitis or tonsillitis and cervical lymphadenopathy)*
- *Intestinal (intestinal pain, vomiting, and diarrhea)*
- *Pneumonic (primary pleuropulmonary disease)*
- *Typhoidal (febrile illness without early localizing signs and symptoms)*

CDC

Clinical Description, cont.

Clinical diagnosis is supported by evidence or history of a tick or deerfly bite, exposure to tissues of a mammalian host of *Francisella tularensis*, or exposure to potentially contaminated water

Centers for Disease Control and Prevention

Laboratory criteria for diagnosis

Presumptive

- *Elevated serum antibody titer(s) to F. tularensis antigen (without documented fourfold or greater change) in a patient with no history of tularemia vaccination or*
- *Detection of F. tularensis in a clinical specimen by fluorescent assay*

CDC

Laboratory criteria for diagnosis

Confirmatory

- *Isolation of F. tularensis in a clinical specimen or*
- *Fourfold or greater change in serum antibody titer to F. tularensis antigen*

CDC

Case Classification

Probable

A clinically compatible case with laboratory results indicative of presumptive infection

CDC

Case Classification

Confirmed

A clinically compatible case with confirmatory laboratory results

Tularemia

cbsnews.com

Nebraska Mowers Get Rabbit Disease

LINCOLN, Neb., June 25, 2003

(AP) Two men who mowed over a nest of rabbits, killing some of them, and another who cleaned the mower developed a rare disease known as rabbit fever, authorities said.

The federal Centers for Disease Control and Prevention has launched an investigation into the incident. The disease, also called pneumonic tularemia, is generally treatable with antibiotics but can lead to pneumonia.

The illness is caused by a bacterium found in wild animals, particularly rodents and rabbits. People can become infected through bites from infected animals or infected insects, handling carcasses, eating contaminated food or, in rare cases, inhaling the bacterium. It is not transmitted person-to-person.

Epidemiology

- Nationally notifiable in the United States
  - About 100 cases per year
  - Summer – tick/deerfly abundance
  - Early winter – rabbit hunting season

Diagnosis

- Immunofluorescent staining
  - Tissue samples
  - Blood
- Serology
  - ELISA, Microagglutination
  - Titer: four-fold increase
- PCR
- Culture and isolation
  - Caution needed for laboratory workers
  - Biological safety level III

Treatment and Prognosis

- Antibiotic treatment 7-14 days
  - Streptomycin
  - Gentocin
  - Doxycycline, Chloramphenicol, Cipro
  - Untreated
    - Symptoms last 1-4 weeks to months
    - <8% mortality overall (all cases)
    - Case-fatality for typhoidal and pneumonic (30-60%)
  - Treated
    - <1% mortality overall (all cases)
- Type A has higher case-fatality rate
- Long-term immunity

Wildlife Disease

Rabbits and hares

- Usually found dead
  - Weakness, fever, ulcers, abscesses, lymphadenopathy
  - Behave strangely
    - Easily captured because they run slowly
    - Rub their noses and feet on the ground
    - Muscle twitches
    - Other: anorexia, diarrhea, dyspnea

Large Animal Disease

- Sheep
  - Outbreaks in enzootic areas
    - Following severe winter
    - Heavy tick infestations
  - Fever, weight loss, lymphadenopathy, dyspnea, diarrhea, isolate from flock, rigid gait
  - Death in young

Large Animal Disease

- Equine
  - Fever, depression, dyspnea, ataxia, stiffness, limb edema
- Swine
  - Adults: Latent
  - Young
    - Fever, dyspnea, depression
- Bovine
  - Appear to be resistant

Companion Animal Disease

- Cats
  - Fever, depression, anorexia
  - Listlessness, apathy
  - Ulcerated tongue and palate
- Dogs
  - Fever, anorexia, myalgia
  - Ocular and nasal discharge
  - Abscess at site of infection

Tularemia Case #1

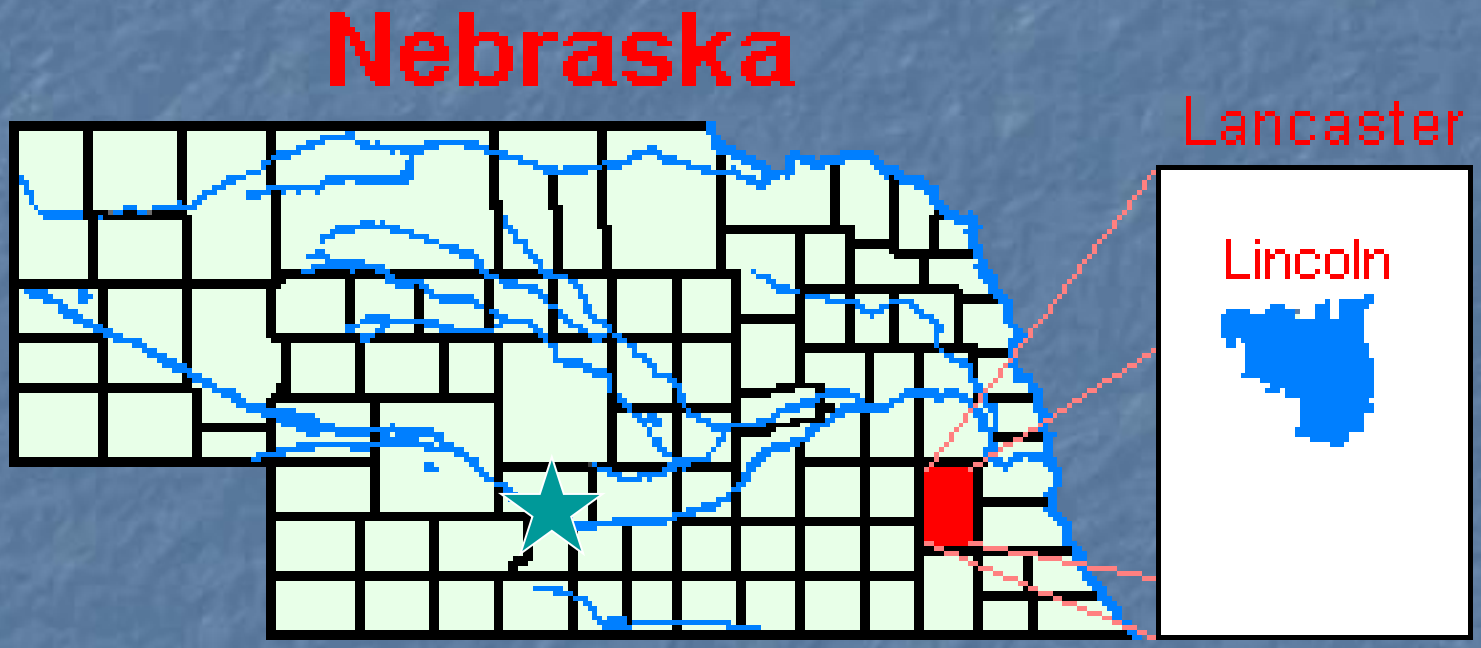
Male white age 13

South Central Nebraska

Healthy, enjoyed outdoor activities

- 6/15/05
  - Groin pain started
  - Ignored pain as much as possible
- 7/18/05
  - Returned from Scout campout due to intense pain
  - Admitted to Hospital
- Marked inguinal lymphadenitis

Tularemia Case #1



Tularemia Case #1

Clinical Signs

- Diarrhea
- Fever 102^{o} F
- Headache
- Severe pain inguinal lymph nodes
- No rash

Tularemia Case #1

Test results

RMSF: Neg

Monotest: Neg

Lyme test: Neg

Cold agglutinin test: Neg

EB test: Neg

Tularemia Case #1

Lab Results

WBC 8,000-15,000

CBC

- Mild lymphopenia
- Increased reactive lymphocytes
- Mild monocytosis with mild left shift

Tularemia Case #1

Physical Exam

Enlarged Inguinal lymph nodes (bilateral)

4 cm x 6.5 cm

Raised , erythematous and fluctuant

No draining abcesses

Tularemia Case #1

Inguinal lymph nodes

Tularemia Case #1
Inguinal lymph nodes

Tularemia Case #1

7/18/05

Lymph Node incision (1.5”), drain, open pack

Administered Gentamycin IV q. 8 hr.

Uneventful recovery

Tularemia Case #1

Lab Results

Francisella Antibodies 1:640 (POS)

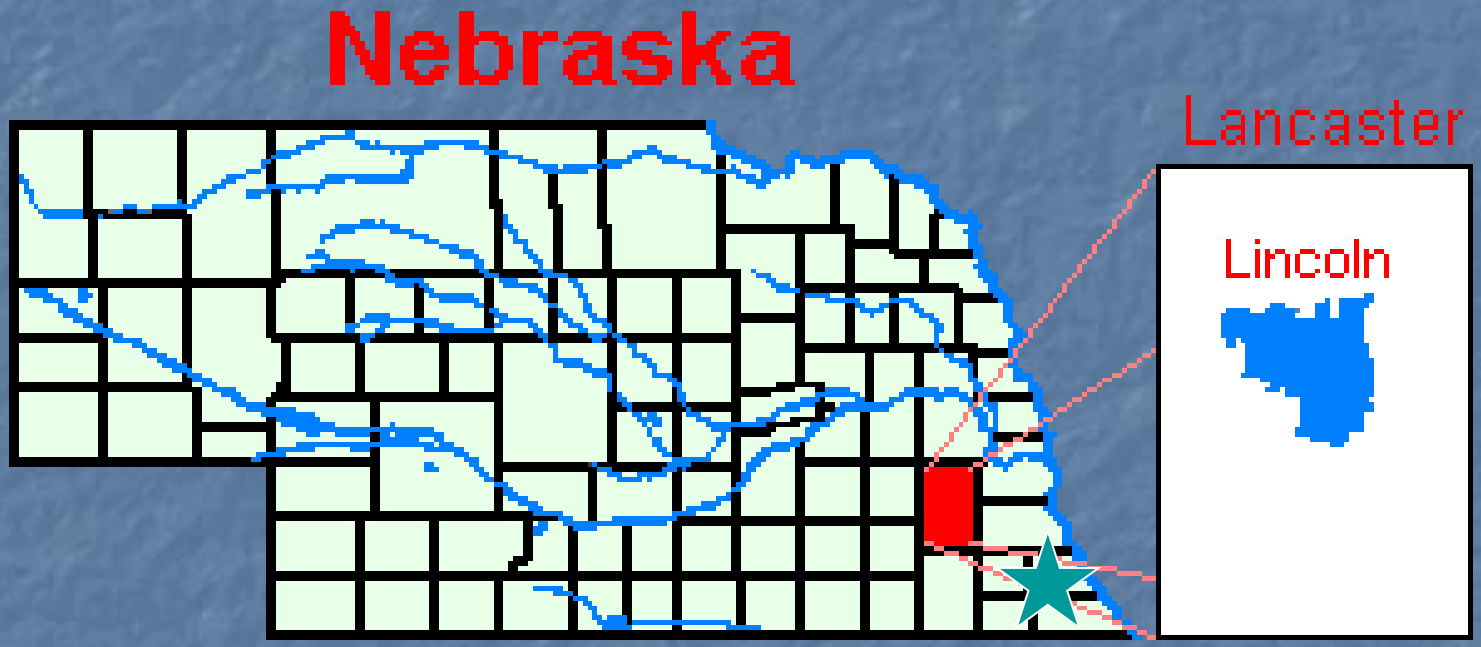
Recalled tick bite in groin area 3-4 days before groin pain began

Tularemia Case # 2

Woman, white age 66
Extreme south-east Nebraska
Rheumatoid arthritis- long term Methotrexate usage

Farm resident
1 dog, 12 "wild farm cats"
Patient observed:
4 cats caught, ate rabbit mid-July
4 cats became ill and 3 died

Tularemia Case #2



7/17/05-

Cat #4

Sick cat bites woman's index finger

Cat dies

Body discarded

- not tested for rabies

Tularemia Case #2

7/20/05 Vomiting and chills start

Patient becomes 'concerned about Rabies'

7/22/05 Hospitalized

Uncontrollable atrial fibrillation

Temp. 104.4 F, pulse 150,

Systolic BP 78

WBC 13.4

Tularemia Case # 2

7/22/05- Began rabies PEP treatment
Discharged 3 days later with oral antibiotics

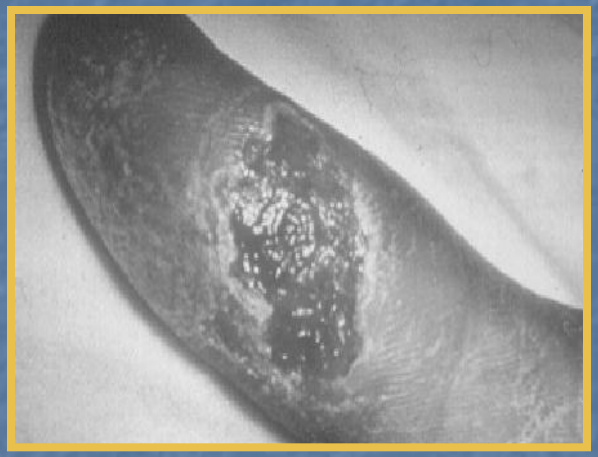
8/3/05- Patient admitted to hospital
chills, nausea, vomiting
Temp: 104.4^{o} F
Severely swollen index finger

Tularemia Case # 2

8/5/05- Lance and cavitate finger abcess

Unasyn- Ampicillin and bacta-lactamase inhibitor IV qid

Dismissed 8/16/05



Culture positive for *F.tularensis* (collected 8/5/05)

Serology (collected 7/24/05) Negative

Public Health Response

- Determine risk factor(s)
- Evaluate other cases
  - Family
  - Community
  - Bio-terrorism event?
- Arrange for confirmatory testing
- Communicate findings with other Agencies
- Educate
- Reportable disease

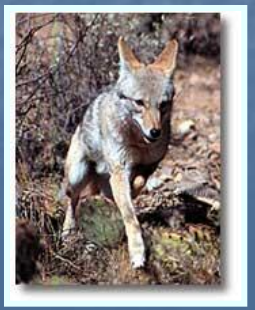
Public Health Response

- Select Agent Rule
- Tularemia surveillance
  - Baseline
  - Environmental differences
    - Historically central Nebraska several positive animals
    - Predator testing: 6% overall seropositive

RABIES

Bite/scratch transmission: Rabies

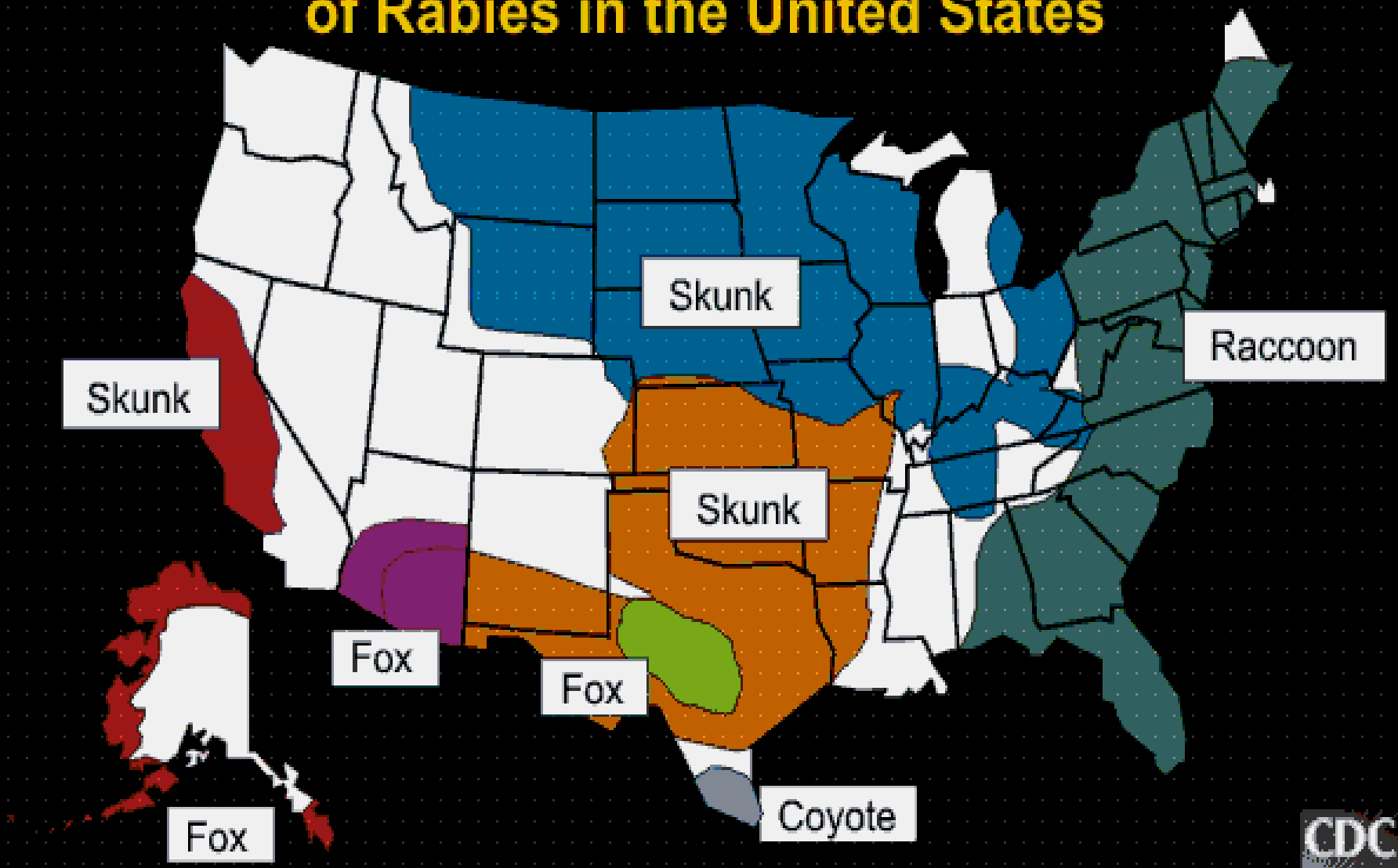
- Viral infection
- Worldwide
- Concentrates in saliva
- Transmitted by bite or scratch (saliva) from a rabid animal
- Invariably fatal without treatment
- Primarily a disease of animals



Animal Reservoirs

- In the US predominantly maintained in wildlife
  - Terrestrial carnivores
    - **Skunk**
    - Raccoon
    - Fox
    - Coyote
  - Bats

Distribution of Major Terrestrial Reservoirs of Rabies in the United States

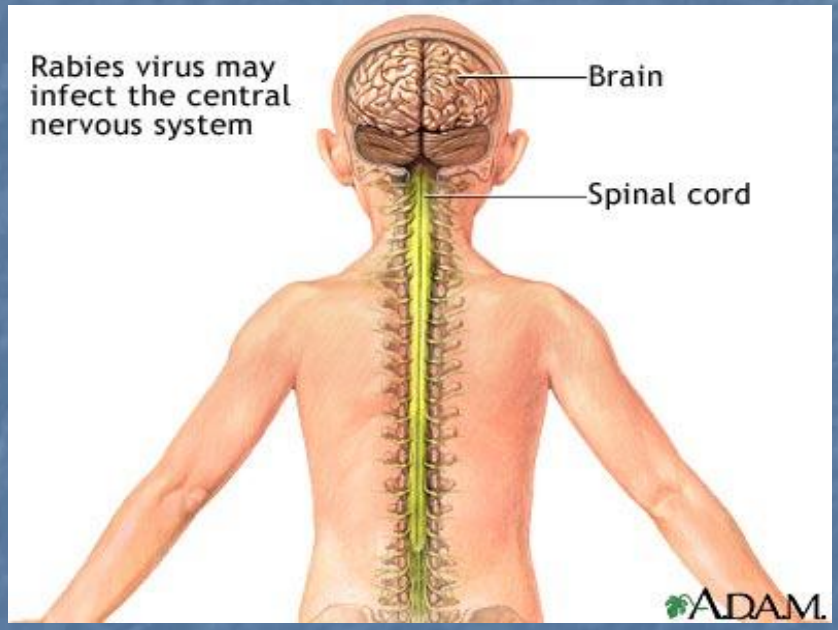


Rabies in Humans

- Incubation 2-8 weeks
  - 10 days to 8 months (7 years)
  - Dose, site of bite, severity
- Symptoms
  - Anxiety, headache, malaise, sensory alterations
  - Excitation phase
    - Hyperesthesia, light sensitivity, increased salivation, muscle spasms
    - Hydrophobia- inability to swallow
    - Aerophobia- muscle spasms of face due to wind
    - May progress to paralytic phase
  - 2-6 Day Duration
  - Death

Rabies Virus in the Body

- Rabies Virus travels from bite wound to nerves
- Virus travels up nerves to spinal cord
- Brain involvement causes typical signs
- From brain travels to innervated organs (salivary glands)



Disease in animals

- Domestic species (dog, cat)
  - Incubation period 10 days to > 2 months
  - Behavior changes
    - Hiding, agitated, circle nervously, startle easily
  - After 1-3 days– excitation phase
    - Dangerously aggressive
    - Abundant salivation
    - Bark becomes prolonged howl
    - Terminal convulsions

Disease in animals

- Domestic species (dog, cat)
  - "Dumb" form
    - Predominance of paralytic phase
    - Short or no excitatory phase
    - Paralysis
      - Head, extremities, generalized
  - Cats
    - Excitatory phase most common

Human Exposure from Suspect Rabid Animal

Stray Dogs
Stray Cats
Stray Ferrets

Confine 72 hours,
If not claimed by owner,

Wild Mammals, (Dog Hybrids, Cat hybrids considered on individual case basis)

Animal vaccinated with approved Rabies Vaccine under NE State guidelines

Confined by Owner or other responsible party for 10 days.
Veterinarian examines animal for signs of Rabies before release.

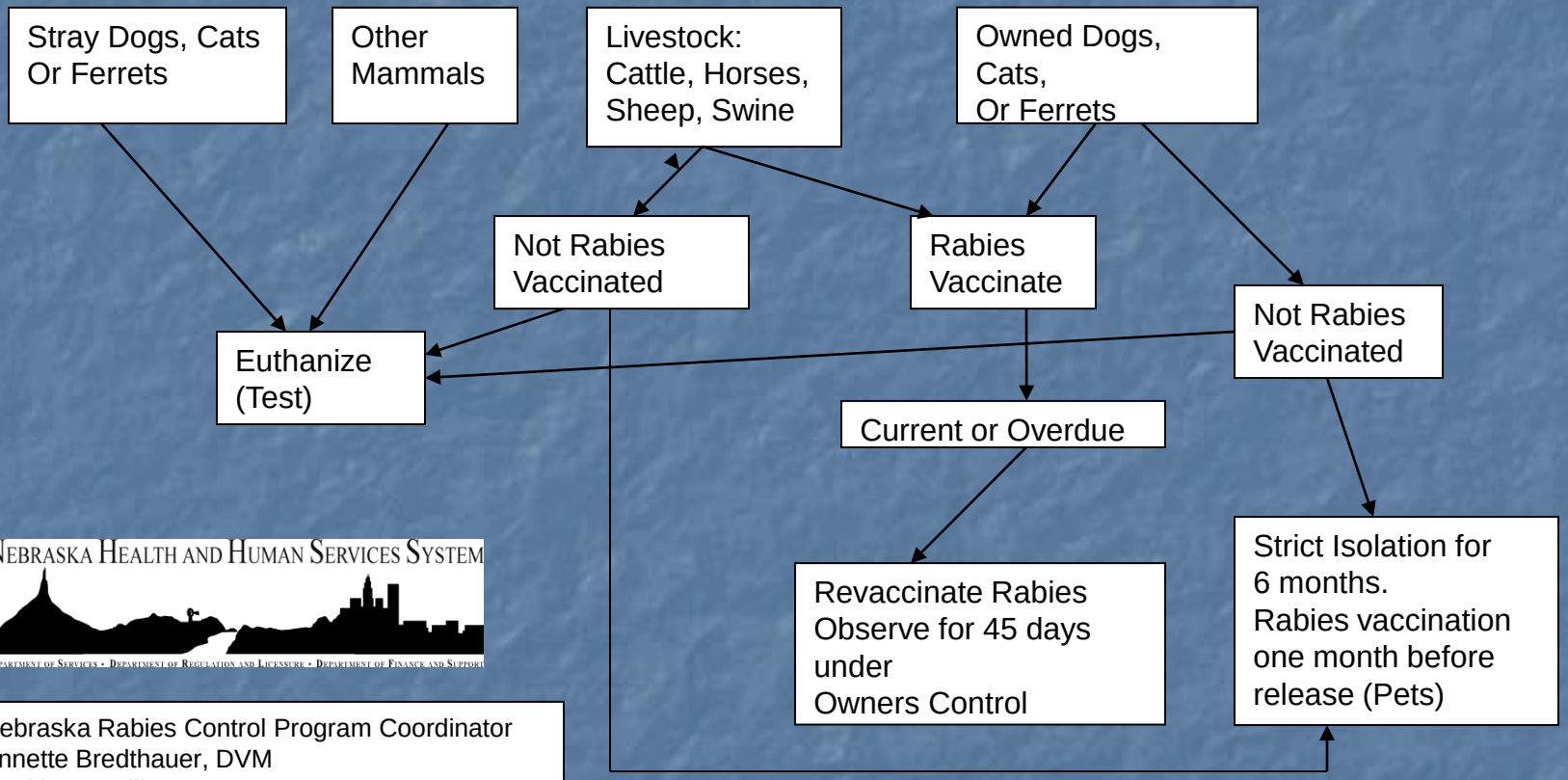
EUTHANIZE
COLLECT BRAIN
SEND TO LAB FOR RABIES TESTING

NEBRASKA HEALTH AND HUMAN SERVICES SYSTEM

DEPARTMENT OF SERVICES • DEPARTMENT OF REGULATION AND LICENSURE • DEPARTMENT OF FINANCE AND SUPPORT

Nebraska Rabies Control Program Coordinator
Annette Bredthauer, DVM
Health Surveillance
P.O Box 95007
Lincoln, NE 68509
(402)471-2937 M-F (402) 471-2400 night/wknd

ALGORITHM FOR HANDLING AN ANIMAL EXPOSED TO A RABID ANIMAL OR WILD ANIMAL UNABLE TO BE CAUGHT AND TESTED (POTENTIALLY RABID)



NEBRASKA HEALTH AND HUMAN SERVICES SYSTEM

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Disease in animals

- Cattle
  - Paralytic symptoms most predominant
    - Stand away from herd
    - Dilated pupils
    - Rough coat
    - Somnolence or depression
    - Stumbling

Disease in animals

- Cattle
  - Excitation more rare
    - Muscle tremor, restlessness, sexual excitement appearance
    - Hypersensitivity at site of bite
    - Muscular incoordination
    - Tonic-clonic contractions of head and neck muscles
    - Difficulty swallowing- stop ruminating
      - Present as 'Choke'

Disease in animals

- Cattle, cont.
  - May show irritation of urogenital tract such as rectal straining
  - Unusual pitch to bellowing
  - May attack and butt any moving object
  - Death

Wildlife

Disease in animals

- Wildlife
  - Act out of character
    - Nocturnal animals out in daylight
    - Uncoordinated- walk in circles, stagger, compulsive actions
    - May aggressively chase people and animals
    - Often act **Tame,** sleepy or paralyzed
  - **Variable incubation** extended periods Skunks
    - Stress may trigger onset of clinical rabies

High Risk Animals

- Wild terrestrial carnivores
  - Raccoons
  - Skunks
  - Foxes
  - Coyotes
  - Bats

All bites must be considered possible exposures.

Rabies Exposure

- Bites
- Saliva or brain tissue in contact with
  - Open wounds
  - Fresh cuts and abrasions
  - Mucous membranes
- Inhalation of aerosols (labs, caves)
- Bat found in rooms with
  - Sleeping persons
  - Unattended children
  - Elderly
  - Intoxicated or mentally impaired

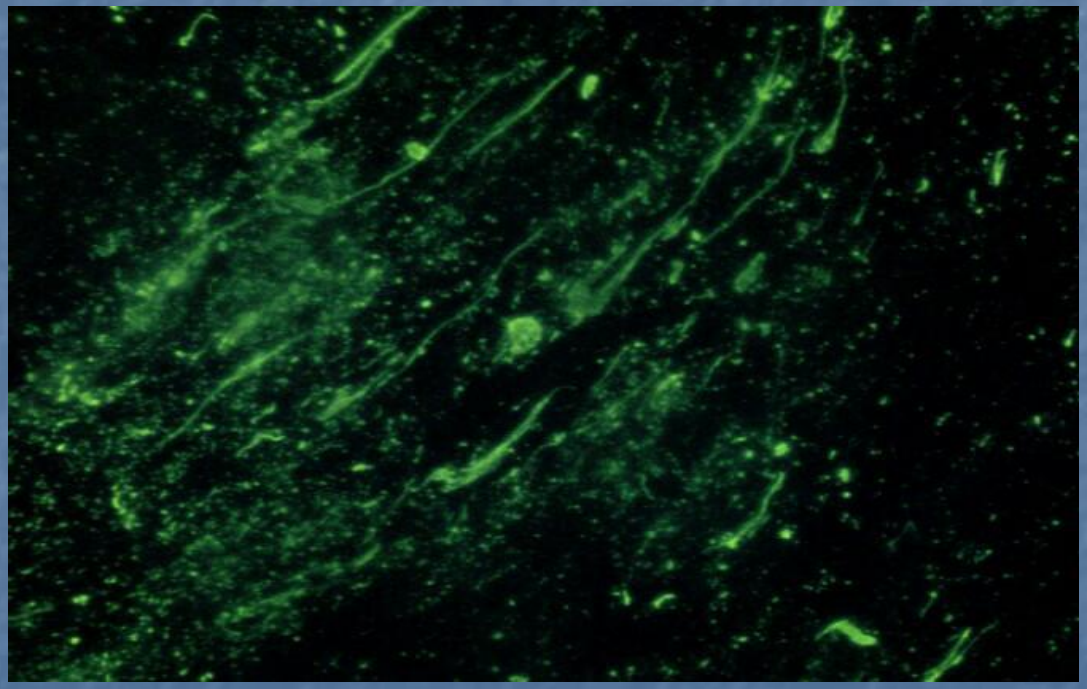
Non-exposures

- Petting or touching rabid animal
- Contact with blood, urine or feces
- Contact with dried saliva
  - Rabies virus is not stable in environment
- Touching pet that had contact with rabid animal (open cuts?)

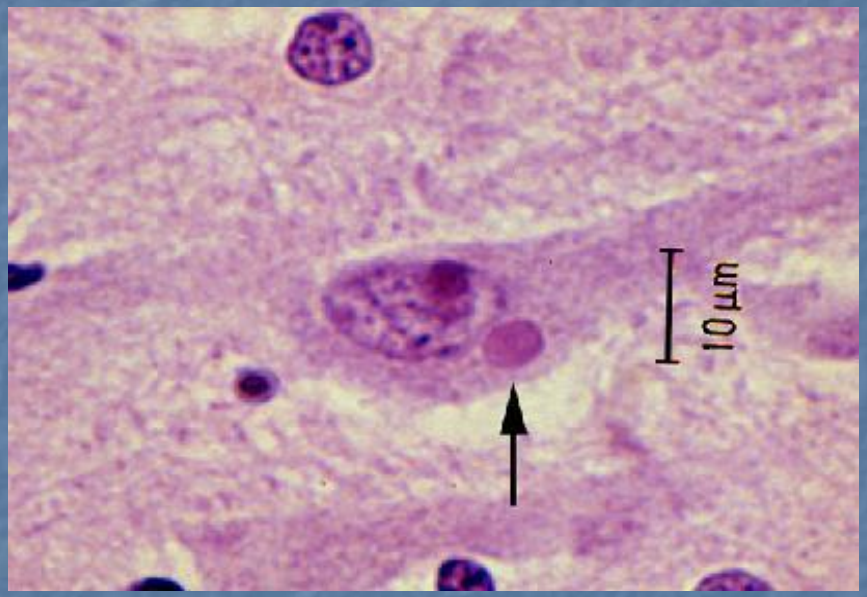
Rabies Specimen testing

- Positive reports phoned/Faxed to Veterinarian and Rabies Coordinator
- HHSS e-mails results to Health Depts.
- Health Dept. contacts person submitting brain
  - Questions
  - Recommendations
  - Report of Post-Exposure Treatments

Positive Rabies (FA)



Positive Rabies- Negri Body



Pre-Exposure Vaccination

- Day 0
- Day 7
- Day 21 or 28

- Intramuscular injection into deltoid muscle (arm)

Aventis Pasteur MSD
Vaccines for Life

RabAvert
RABIES VACCINE
CHIRON

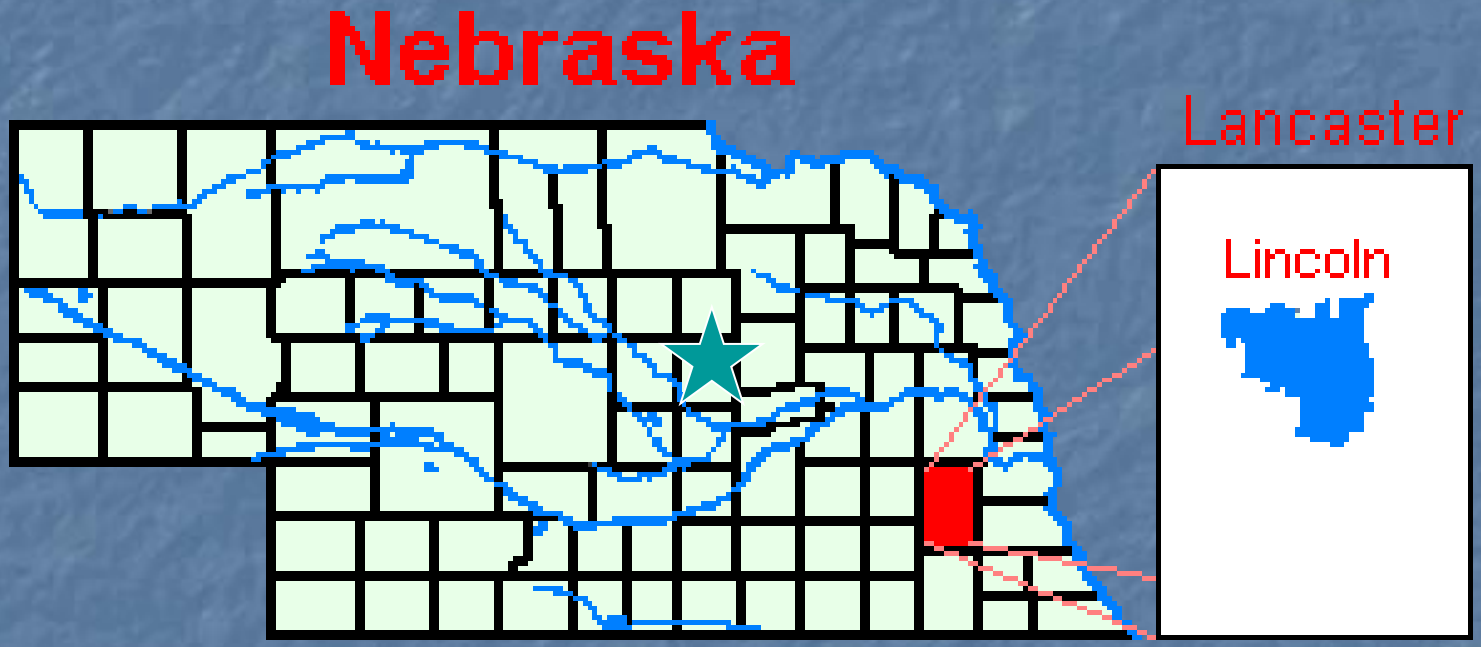
Post Exposure Treatment I.M.
No Pre-exposure Vaccination

- Day 0 Rabies Immune Globulin Local and I.M. + Rabies Vaccine
- Day 3 Rabies Vaccine
- Day 7 Rabies Vaccine
- Day 14 Rabies Vaccine
- Day 28 Rabies Vaccine

Rabies Incident #1

Central Nebraska County Fair- August 2005

Rabies Incident #1



Rabies Incident #1

- Day 1
  - 4-H Steer brought to barns with other cattle
  - Drank water from 200 gallon community tank, which is also used by children to cool off
- Day 2
  - Steer begins to bellow and drool saliva
  - Steer stops eating and drinking
  - Vet examines steer and sends it back to farm
- Day 3
  - Steer returned to fair for second examination
  - Very weak and shakes while standing
  - Several 4-H youth and fathers help to unload steer and push into chute

Rabies Incident #1

- Day 4
  - Steer's condition deteriorates at farm
  - Second Vet examines
  - Euthanized and submitted for rabies testing
  - Brain shipped to KSU Rabies Lab on Friday
- Day 7 (Monday)
  - Positive results for rabies
  - HHSS notified by FAX after hours
  - Vet notified by phone call that evening

Rabies Incident #1

- Issues– who was exposed?
  - "Concerned" individuals
    - Other 4-H cattle- direct and tank exposure?
    - People walking through cattle barns?
    - Family transporting steer?
    - 4-H youth playing in cattle drinking tank ?
    - 4-H youth, parents helping to load/unload steer?
    - Veterinarians and staff (2 clinics)?

Rabies Incident #1

- Issues –
  - Liability
    - Veterinarian
    - County Fair Board
    - County Commissioners
    - Steer owner

Rabies Incident #1

- Issues "Who's in charge?"
  - County commissioners
  - Parents of 4-H youths
  - Health Departments (2)
  - Veterinarians (2)
  - Medical providers (3-4)
  - HHSS State level

Rabies Incident #1

- Result of no clear organization in charge
  - Duplication of efforts
  - Parents conducted 'epidemiological' meeting to find who felt that they were exposed (>100)
  - Commissioners under pressure developed policy of "free rabies shots"
  - Inconsistent messages released on risk and exposure

Rabies Incident #1

- Public Health Response
  - Empower local Health Departments- jointly
  - Issue Health Alert Network message to Vets and Medical community detailing water tank as non-exposure
  - Issue press releases to media
  - Visit with concerned people regarding potential means of exposure

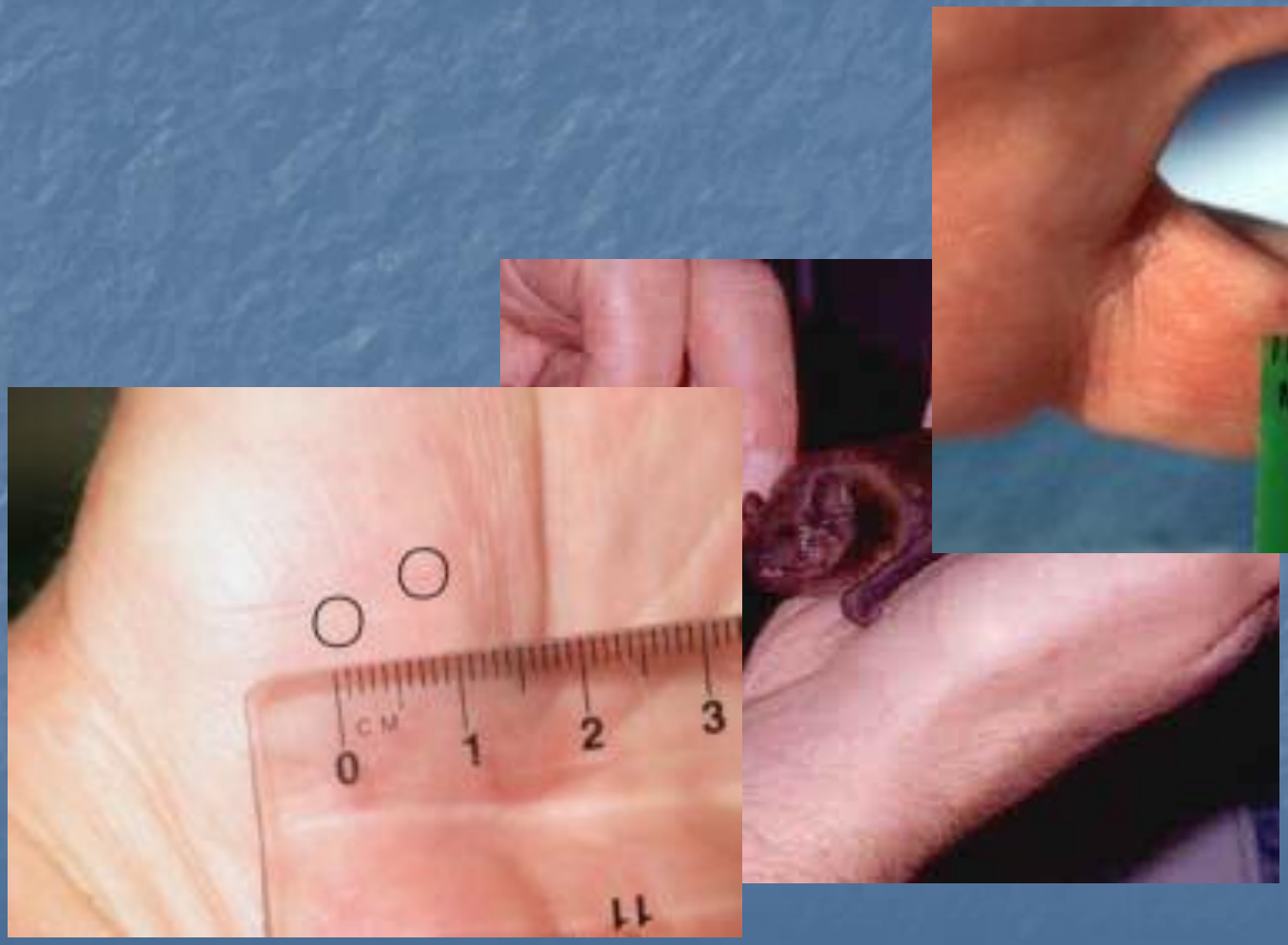
Rabies Incident #1

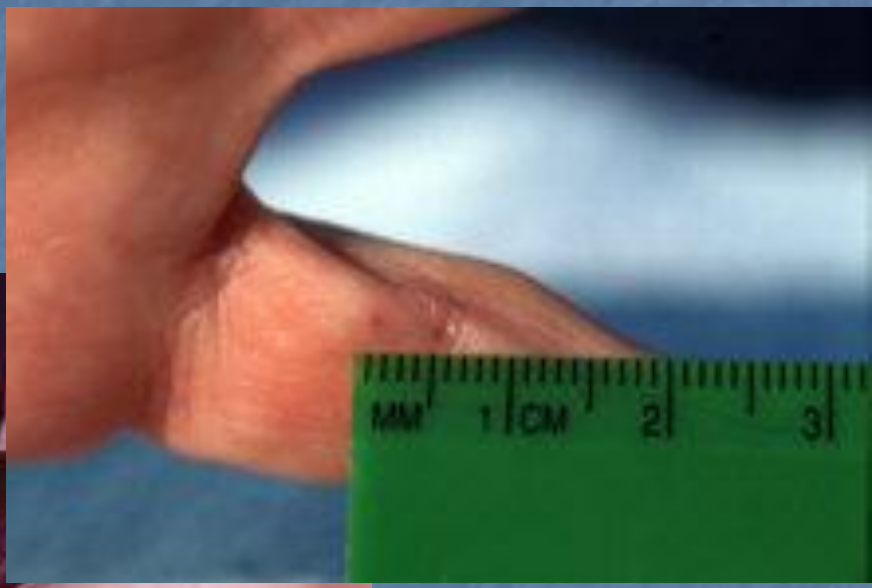
- Post-Exposure Prophylaxis
  - Exposed
    - Family owning steer (4)
    - Veterinarians (2)
    - 4-H youth, parents loading steer on Day 3 (8)
  - Non-exposed
    - Youth, families at fair (51)

Rabies Incident #2

- Person woke to find a bat flying around the bedroom
- The Window was opened and bat flew out

Bat Bites





Rabies Incident #2

Public Health Response

- Recommend Rabies Post Exposure Prophylaxis
- Press release to local media about bats as vectors for rabies

Slide Acknowledgements

- Centers for Disease Control and Prevention
- The Center for Food Security and Public Health, Iowa State University